SNAKES OF WESTERN CHIHUAHUA

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ABSTRACT.—This is a report on the snakes of western Chihuahua that were taken at intervals from 1956 to 1972. At no time did we attempt to collect east of Highway 45, rather expending our time in the foothills, valleys, and desert ranges east of the mountains and in the highlands of the Sierra Madre Occidental.

Reference is made to reports on the geological and ecological aspects of the area as a whole, but without a major attempt to duplicate previous studies. A brief gazetteer and a map are included as guides. To provide orientation to the area traversed by the John Cross expeditions, a map of the lower Rio Urique and Rio San Miguel is also included.

From the area studied, 28 genera and 51 species are listed, with three new subspecies described: two worm snakes (*Leptotyphlops humilis chihuahuaensis* and *Leptotyphlops dulcis supraocularus*) and a garter snake (*Thamnophis rufipunctatus unilabialis*). For a number of species it became necessary to expand the study into populations from adjoining states in Mexico and the United States. Such species as *T. rufipunctatus* and *R. hesperia* are examples. Where data were available systematic relationships were implied, as well as ecological and biological data.

This study is an outgrowth of a series of herpetological investigations and a number of conversations with individuals who have spent many years in various parts of Mexico. I was constantly enthused with the idea of spending time in Mexico, and, upon my arrival at the University of Kansas in 1946, where I became associated with Dr. Edward H. Taylor, I was even more motivated by his constant references to the fabulous herpetological fauna of this neighboring country to the south. My association with the plethodontid salamanders, which through the courtesy of Dr. Taylor served as the subject of my dissertation, demonstrated there were new species and subspecies to be discovered. The thrill of discovering the new genus *Lineatriton* left little doubt in my mind that someday I must visit the area and become more involved in understanding the herpetological faunas of this fascinating republic.

I remember distinctly a conversation with Dr. Taylor during my visit to the University of Kansas in 1952, at which time I was trying to prepare for my first adventures into Mexico. After we discussed some of the problems that seemed pertinent to my understanding of the faunas extending from Mexico into the southwestern U.S., he advised me emphatically to not worry about getting into the central and southern parts of Mexico, but to start collecting as soon as I had crossed the Mexican border. He suggested that perhaps one of the areas most neglected was the state of Chihuahua.

Preliminary studies from the small collection that then existed at Brigham Young University (BYU) indicated there were a number of relationships, particularly as I understood them in the serpents, that must yet be understood not only from the standpoint of taxonomy, but also from the standpoint of geographical distribution. Also, a small collection made by Dr. D Eldon Beck in 1931 included a juvenile skink from the vicinity of Colonia Garcia. It was not possible to key this specimen to any of the materials described and discussed by Taylor (1936) and others, and it was eventually found to represent a new species (Tanner 1957). My visits with some of the students from the Mormon colonies in northern Chihuahua convinced me they were familiar with a fauna that was unique to that area, and certainly not one that was commonly understood by most of the herpetologists with whom I had visited. Thus, in May 1956, in company with Mr. Verl Allman and my oldest son, Lynn, we spent a month in northern Chihuahua, spending most of our time in the area of Nuevo Casas Grandes and Colonia Juarez, with one trip into the mountains of western Chihuahua at Three Rivers (Tres Rios) on the Río Bavispe.

Each year, from then until 1972, trips were

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made into Chihuahua at various times during the summer from May into October. My companion in 1957 and on through the next three years was Dr. Gerald W. Robison. Perhaps the three most noteworthy trips were made in 1957, 1958, and 1960, during which times much of the mountain area west of Colonia Juárez and west of Ciudad Chihuahua was visited. The trip in 1958 reached its climax at the mining town of Urique on the Río Urique in the Barranca del Cobre.

In 1960 an extended trip was made into the barranca country, where we visited the mining town of Maguarichic, and thus were in the vicinity of the area collected by Dr. Irving W. Knobloch (Taylor and Knobloch 1940). Other trips will be mentioned as it becomes important to do so, but it should be noted that the emphasis on our biological surveys was to cover as best we could in the time available to us the area west of Highway 45 that extends from Ciudad Juárez south to Parral. The only important area that we were not able to visit was the area southwest of Parral across the headwaters of the Río Conchos and into the headwaters of the Río San Miguel, and the tableland area near Guadalupe y Calvo. We were, however, fortunate in having received a collection from Mr. John Cross as he traversed the area southeast of Guachochic and then boated down the Río Verde and San Miguel rivers to their junction with the Río Urique. Mr. Cross also provided some specimens from the Urique River north of the town of Urique. Figure 8 indicates the extent of his travels.

The state of Chihuahua is 245,612 square km and is the largest state in the Mexican republic. Its territory is approximately 12.5% of the total area of Mexico. Within the state are many diverse ecological habitats ranging from deserts in the eastern and central areas to subtropical areas in the southwest barrancas. As should be expected, the vegetation is very diverse, from desert and dune floras in the eastern deserts to the pine-oak forests in the western mountains. Between these extremes are the multitude of ecological niches that change with the seasons from dry, rocky, scrub, brush foothills to fields of waving grasses and other flowering plants after the summer rains have renewed the area. For a more complete study and review of the Chihuahuan Desert see Morafka (1977).

Ecologists have established various life zones in northern Mexico that have included the state of Chihuahua. Perhaps the report compiled by Leopold (1950) and summarized by Knobloch and Correll (1962) gives a general overview useful to an understanding of the diverse biotic zones encountered in this state.

Knobloch and Correll (1962) summarized these zones as follows:

1. Boreal forest: rare, found only at 3000–3200 m (Cerro Mohinara).
2. Pine-oak forests: ranging from pure pine forests to mixed pine/oak and scrub oak.
3. Chaparral: mostly shrubs and small trees other than oak.
4. Mesquite-grassland: the short grass plains, mesquite shrubs and grasslands east of the Sierras.
5. Desert: cactus-euphorbia-yucca and creosote bush.
6. Tropical deciduous forests: short thorn forests of the western barrancas.

Chihuahua may best be considered a steppe desert, in which there is no certainty as to when or how much precipitation may occur in any given year or at any locality. At times during July and August, heavy rains occur, producing heavy runoff in local streams, but this is not always widespread nor constant. Thus, Chihuahua has much dry terrain and there are many small or intermittent streams during most of the year. During the rainy season streams may be in flood for a short time, requiring traffic in local areas to wait for the streams to recede. We encountered these conditions several times, but usually for only a few hours or, at most, a day.

The heavy runoff in the desert valleys and mountains rutted the roads, most of which were dirt, exposing rock and making travel off the main highways difficult and hazardous. Because of the rugged Sierra Madre Occidental, which extends through most of western Chihuahua,, few roads are available, and these often in poor condition. Roads in the mountains were passable, particularly where mining or lumber companies were operating; however, if these companies closed or moved, the roads soon deteriorated. Furthermore, most traffic was from the mountains eastward

since the abrupt escarpment and the deep canyons on the west limited travel to means other than a car.

It was not until the 1960s that the railroad from Ciudad Chihuahua to Creel and on to Los Mochis, Sinaloa, was completed, providing for the first time a route across the mountains. Prior to this, travelers going westward from eastern Chihuahua had to first go north, usually into the U.S., and then into Sonora, or go south to Durango. Our trip to Urique took advantage of the newly built railroad grade (then used as a road) from Creel to Cuiteco, but we were three hours going seven miles from Cuiteco to Cerocouhui and from there to Urique, a nine-hour trip by mule.

GEOLOGY AND PHYSIOGRAPHY OF CHIHUAHUA

The state of Chihuahua has been part of an area of extensive mountain building that has occurred throughout much of western Mexico, extending northward through most of western Chihuahua. The Sierra Madre Occidental uplift reaches its highest elevation in the south central part of Chihuahua, where the Cerro Mohinara perhaps serves as the highest elevation, reaching to at least 3200 m (10,500 ft). There is a gradual reduction in elevation from south to north, with the mountains terminating in low passes of about 1500 m (5000 ft) near the border of Chihuahua and the states of Arizona and New Mexico. The uplift provided for a steep escarpment on the west side, resulting in heavy erosion cutting deeply into the mountains and developing the deep canyons and barrancas. To the east the escarpment is less severe, owing to the erosion that filled the adjoining valleys with sediments in the form of many large and extensive alluvial fans.

According to geological reports of scientists who have explored the Sierra Madre (Rothwell, Raymond, and Hobart 1901, Knobloch and Correll 1962, Goldman 1951, Hovey 1907, West Texas Geological Soc. 1964, and 1974), Chihuahua is underlain primarily with Cretaceous limestone that has been capped in many localities by rhyolite and basaltic flows in numerous areas along the major fault lines both to the east and west of the uplift. According to Forrest Shreve (1939), the state can logically be divided into five physiographical zones:

1. The bajados, gentle slopes in the eastern section of the country, including the lower portion of the Río Conchos and the large area to the east and northeast.

2. The enclosed basins, particularly of the northwest, which are referred to as Bolsons and have no outlets except into the stagnant lakes such as the Guzman and Santa María. These lake beds are filled with sandy silt and usually possess shallow water with a high salt content.

3. The elevated plains, the central portion of the state, extending, for the most part, through the central part of Chihuahua, and including the lower desert ranges and valleys immediately east of the Sierra Madre uplift.

4. The Sierra Madre region, the mountainous western part of the state. Through this area winds the Continental Divide, separating such streams as the Río Conchos and the Río Fuerte, whose headwaters immediately east of Guachochic are divided by a relatively narrow ridge. It is, however, in the western part of the Sierra Madre region that the deep barrancas have been formed—in contrast to the more gentle canyons and streambeds east of the Continental Divide.

5. From the standpoint of a herpetologist, a fifth region, which may be referred to as the barranca area, provides a distinct biological zone. The zone fingers into the mountainous areas from west to east and provides in the deep canyons (such as the Barranca del Cobre) a series of subtropical habitats not found in any other part of Chihuahua. The floor of these deep canyons are of reduced elevation, such as at Urique, to about 600 m (2000 ft), and thus the thorn forests of northern Sinaloa have extended far into these narrow canyons. It is estimated that the height of the barranca rim above and west of Urique is at least 1800 m (5800 ft).

The sediments, occurring in much of western Chihuahua, consist of limestones capped in many areas by a large outflow of tuft and other loose, volcanic materials. Such formations have been subject to rapid erosion, resulting in the deep canyons along the western escarpment of the Sierra Madre. Only below the headwaters of such streams as the Río Urique and the Río Conchos occur waterfalls and severe rapids where the streams have encountered more resistant sediments. It

should be noted that during the rainy season the streams may become torrents and deepen rapidly these steep, deep canyons (Shreve 1944). Because of the rapid erosion through the various stratifications of the Sierra Madre uplift, deposits of minerals have been exposed, primarily silver and associated lead. However, copper is also exposed in various areas and has been responsible for the name "Barranca del Cobre." Because of the numerous ore deposits, areas in Chihuahua that would not otherwise be explored biologically may be reached by roads built to the mines.

The mountainous area varies in width from about 130 to 160 km (80 to 100 miles) in the south, that is, west of Parral and from 65 to 80 km (40 to 50 miles) west of Colonia Juárez. Within these areas there may be many comparatively flat park and meadow areas as well as gentle slopes with considerable timber. Most of the headwaters of such streams as the Bavispe, the Papagochic, the Conchos, and some of the tributaries of the Urique and Oteros drain these highland meadows and parks, and it is not until the streams reach near the west or east escarpments that the terrain is cut into deep canyons or barrancas.

Perhaps the most noted of the barrancas is that of the Barranca del Cobre, in which the Río Urique flows; it is not a swiftly flowing stream in its canyon toward the headwaters, but downstream it soon becomes a series of waterfalls and rapids, in some areas deeply undercutting the lateral canyon walls, in turn resulting in much shearing of the steep walls in the riverbed below—even to the point of permitting the river to flow among and under great masses of boulders. It was this type of terrain that made our river running trip in 1963 a failure (Fig. 9).

Considerable publicity about this trip occurred in Chihuahua and the southwestern United States. Actually, we descended the river for about 16 km (10 miles); during this time, several rapids and waterfalls were encountered. These did not stop us, but later, when the river partly or totally disappeared under large, granite boulders for great distances, it became impossible to continue. The next year John Cross and his associates did enter the Barranca del Cobre near the Divisidero, and they ran the Río Urique to the Río El Fuerte. They also entered the Río San Miguel south of Guachochic and ran it to the El Fuerte. During these river running trips, Mr. Cross made collections that included several genera and species not previously known to occur in Chihuahua. The Cross collections (three trips) are deposited in the BYU herpetological collection.

Previous Herpetological Surveys

Perhaps the first significant herpetological survey of Chihuahua was that of Edward A. Goldman (made under the direction of Dr. E. W. Nelson). Although his work was done from the fall of 1898 into October of 1899, his study was not published until July 1951.

Much of his report is concerned with the geography, geology, and flora of various localities, but herpetological specimens were obtained and deposited in the U.S. National Museum. It should also be noted that the Goldman-Nelson travels in Chihuahua did not cover much of the central part of the state but were confined to the northern area, Nuevo Casas Grandes and areas to the north and west, and the southern area from Parral westward across the mountains to Batopilas and the Barranca del Cobre.

During the 1930s and early 1940s, Dr. Irving W. Knobloch investigated the fauna and flora of the west central mountains of Chihuahua in the vicinity of Majorachic. This collection was reported by Taylor (1940) and by Taylor and Knobloch (1940). Several other biological surveys have also been made into Chihuahua; the one by Dr. James D. Anderson was confined largely to the Sierra del Nido area, and his material is primarily deposited at the University of California at Berkeley.

In 1942 Dr. Hobart M. Smith briefly reviewed Mexican and Central American *Thamnophis* and described as new the subspecies *T. ordinoides errans*. He also spent time studying the herpetological fauna along the Río Santa María and its environs.

Other field trips originating at the University of Kansas, the University of Illinois, and the University of Texas at El Paso have added to the specimens available for study. A collection from Yepómera was made by members of the University of Arizona, and a special study of *Thamnophis* and *Natrix* was conducted by Dr. Roger Conant. A trip by Kenneth L.

Williams, Edward O. Moll, Francois Vuilleumier, and John E. Williams (Smith et al. 1963) down the Conchos River in August 1962 was one of few that has attempted to collect in the desert areas east of the main highway. Reynolds and Scott (1982) reported on a series of 20 species taken along Highway 16 between Villa Aldama and El Pastor. This was a study of food and habitat selection in northeastern Chihuahua from 1975 to 1977. There undoubtedly have been other collections made, but those indicated above apparently represent the most important collections.

GAZETTEER

Some of the localities from which many of our specimens were collected are listed below with various comments concerning their location and general habitat (Fig. 1).

Colonia Juárez

This is a Mormon colony established before 1900 and serving since then as headquarters for the colonists. It is basically a farming community with a considerable emphasis in recent years on orchards, with apples and some pears and peaches the primary crops. It is located along the Río Piedras Verdes which flows directly eastward from the mountains west of the colony.

From its eastern border one looks toward the east at the old settlement listed on maps as San Diego. Rolling hills surround the town, with the escarpment of the Sierra Madre Occidental showing sharply to the southwest. To the north and northeast are rolling hills and a relatively broad, open canyon known as the Tinaja extending westward into the mountains. To the northeast of the mouth of the Tinaja are some rolling hills that have been productive in our collecting program. The environs of Colonia Juárez support a herpetological fauna in which not only the more desert species occur along the base of the escarpment, but also species more commonly found in the mountains descend into the mouth of the canyons and along the streams.

The climate in this part of Chihuahua is relatively dry from September through the winter months and into June. The summer rains usually begin in late June and continue intermittently through July, August, and early September. This part of Chihuahua is a steppe desert, receiving much of the moisture from the southeast as the tradewinds circle into the area from the Gulf of Mexico, but with some storms being initiated from the southwest. The winters are mild, but with some precipitation in the form of snow and an adequate period of cold to favor temperate zone vegetation.

Some of the summer precipitation is heavy, producing considerable runoff and, at times, closing roads and flooding the lowlands. When the first heavy rains come in July, the desert flats east of Colonia Juárez and N. Casas Grandes are alive with amphibians; in fact, in some areas they become so numerous that it is impossible to drive the roads without a continual popping sound as the inflated individuals are mashed on the road. In this area and throughout some of the valleys to the east, the dry season provides an opportunity for collecting mainly lizards, with only a small population of snakes extant. During the rainy season, there is a greater percentage and a greater variety of snakes to be found along the roads and under rocks and other debris throughout the area.

Ciudad Chihuahua

The basin in which Ciudad Chihuahua is located drains from the northwest toward the east. Our collecting was done primarily northwest of the city; this area was actually a lower, southern end of the Sierra del Nido. We were concerned with the foothill areas and did not move into the higher elevations of this range. The eastern sloping foothills and their alluvial fans provided a habitat in which the scrub brush and cacti were separated so as to provide no difficulty in walking through the terrain. Also, there were a number of rocky outcroppings and boulder-strewn flats providing an opportunity for collecting, particularly during the rainy season that brought the more secretive burrowing forms to the surface. Extending westward from Ciudad Chihuahua for many miles, almost to Cuauhtemoc, is a terrain similar to these foothills.

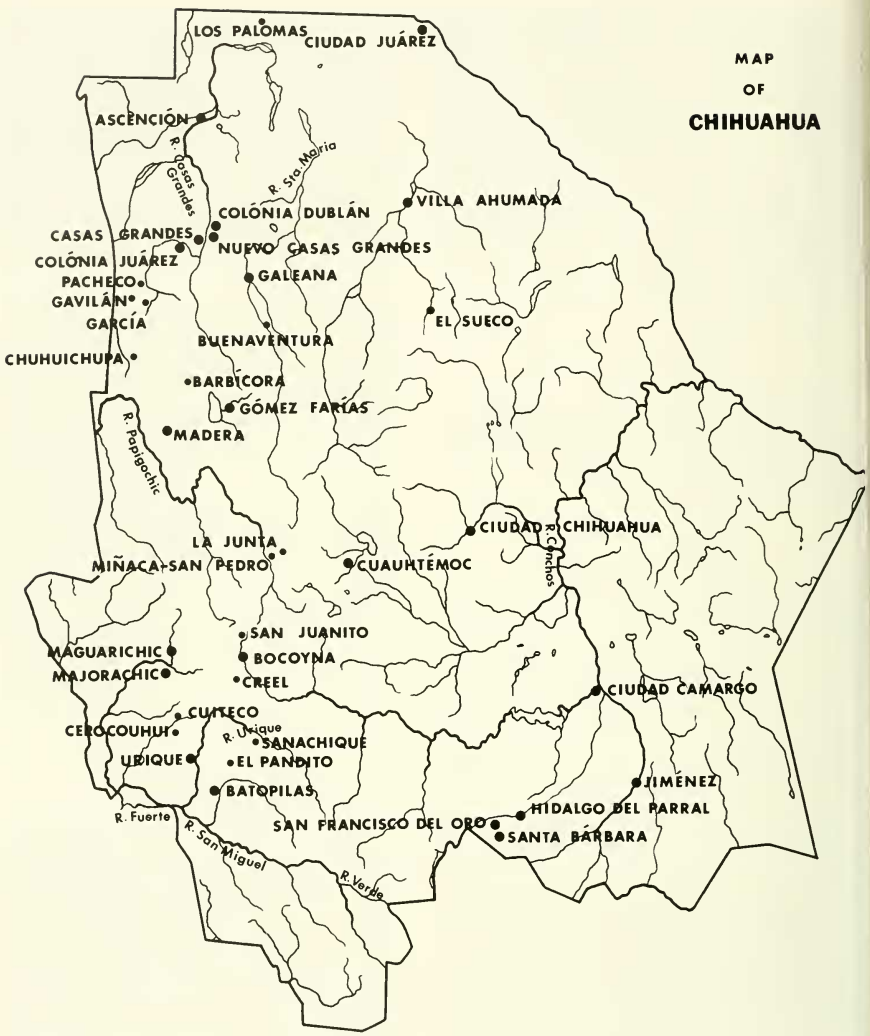

Fig. 1. Map of Chihuahua.

Maguarichic

Maguarichic is located on a bluff overlooking the deep canyon of the Río Oteros. It is a mining town and was at one time a thriving community. We were there for three days during the rainy season of 1958 and were successful in securing a number of specimens, some of species not previously reported by Taylor and Knobloch (1940) from Majorachic. We attempted to visit Majorachic, but the roads were so muddy that we were unable to ascend some of the hills leading into the town.

We did, however, remain in the general area a few miles southeast of it. The entire area here was covered with vegetation, a long leaf pine, oak, madrone, and other trees and shrubs. This area is on the high, mountainous plateau and drains southwestward into the smaller tributaries of the Río Oteros. The area between San Juanito and Maguarichic is the high, mountainous area lying mostly to the west of the Continental Divide that lies a few miles west of San Juanito; thus, there are in this generally mountainous area not only pines, but also Douglas-fir and Chihuahua spruce, particularly on the northern sloping ridges.

Cuiteco-Cerocouhi Area

We left Creel and traveled along the railroad grade which, in 1958, was serving as a highway while the Mexican government built the railroad on through the mountains to Los Mochis in northern Sinaloa. The grade had been finished to Cuiteco, and we were privileged to stay in some government-owned cabins while we organized for the short run to Cerocouhi. The latter was only seven miles from Cuiteco by road but required over two hours to traverse. At Cerocouhi we were housed in some government buildings that had been used as a headquarters during a mosquito abatement survey. It adjoined the Catholic church and a nunnery. We spent two days there while Dr. Knobloch arranged for a mule train to take us to Urique. The area in and around Cuiteco and Cerocouhi was on small tributaries of the Río Oteros, and during much of the time that we were there the streams were at flood stage. The area to the east of these towns was forested with oak, madrone, and scattered (particularly on the higher ridges) pine. Much of the area in and around Cerocouhi had been overgrazed, but in the small canyons to the east across the main stream were boulder-strewn alluvial fans mixed with some oak forests that provided suitable habitat for a number of amphibians and reptiles.

Urique

Urique is a mining town that has been largely abandoned as far as mining is concerned. We discovered here the same situation that occurred in other almost-abandoned mining towns where the inhabitants were left stranded after the mines closed; although Urique had been a very prosperous mining settlement, only a few people were working the mining area at the time we were there, and any ores mined were hauled out by burro packtrains.

The town is located on the Urique River at the bottom of the Barranca del Cobre. The vegetation there is subtropical. We stayed in a large building next to the dwelling of the "Presidente," and to the side of the building were mangos, wild figs, and other subtropical trees and shrubs. A short distance away from the river on the slopes were thorn forests with the leguminous cat claw predominating and serving as a real deterrent to one wishing to hurry through.

Although we were forced to select areas where we could collect without vegetational hindrances, we found a few areas of rocky outcroppings along the river. We were led by some of the Mexican children to the old stone wall around the cemetery, where we secured a number of iguanids and other rock-dwelling species. It may be of interest to note that in some of the old graves the deceased were not fully buried but placed in crypts and could now be seen through the cracks as skeletons. Many of these tombs had been elaborately constructed during the height of the mining boom of Urique.

Three Rivers Area

The Tres Rios area of western Chihuahua and eastern Sonora derives its name from the junction of three streams that form the Río Bavispe. These streams (Chuhuichupa Creek, Trout Creek, and Black Canyon Creek) flow northwest as does the Bavispe. We collected along the stream, in the small side canyons, and on the sides of the main canyon. Although the canyon has steep slopes, there are ledges and talus to provide for a variety of habitats. Oak was dominant on the lower slopes, with some long leaf pine on the higher ridges. Along the streams were sycamore, cottonwoods, and willows. This area was visited in May 1956 and in June 1958.

Chuhuichupa

This Indian name refers to the mist that forms in the valley on the cool mornings following afternoon or evening thunderstorms. The few American inhabitants used the term "valley of the mists" to explain the term. The valley lies in a high mountain basin, draining to the north and then west to join with other streams (Black Canyon and Trout Creek) at Three Rivers to form the Río Bavispe.

Above the town of Chuhuichupa is a series of large springs that are the major sources of Chuhuichupa Creek. To the west through a low pass is Black Canyon Creek, which flows northward in a parallel canyon to join Chuhuichupa Creek at Tres Rios. The headwaters of these streams are in open basins with gentle slopes and meadow pastures. The steeper slopes and ridges surrounding these basins are forested; thus, these areas provide a variety of habitats for a large number of species.

Creel

The city of Creel is located in a high basin just north of the Barranca del Cobre. During our work in this area, this was the terminus of the railroad that has since been extended across the mountains to Los Mochis, Sinaloa. The area around Creel is a series of rolling hills and basins with slow-flowing streams. As one moves south, the canyons deepen as streams join the deep canyon of the Río Urique. Besides being a railroad junction, Creel serves as a road junction for travel to the south and west. The La Bufa Road connected Creel to the headwaters of the Río Urique and to Batopilas and ore mines south of the west-flowing Río Urique.

The area of Creel and north to San Juanito is in the higher mountain valleys, with the Continental Divide lying between them. Thus, the roads into these valleys were difficult and, during the rainy season, often impassable.

La Bufa Road

This area about 25 miles southeast of Creel on a small, south-flowing stream with low, boulder-strewn hills was a very productive area. We were there in July during the rainy season. Low-growing trees (oak and madrona) and shrubs mixed with grass provided the general habitat. This area is on the plateau north of the Barranca del Cobre.

List of Genera and Species

The serpent fauna of the state of Chihuahua is rich, primarily because of the diverse habitats that occur in various areas of the state. Of the various faunas that have invaded the state of Chihuahua from practically all sides, we can now recognize from the Smith-Taylor checklist (1945) a total of 18 genera and 39 species and a total species-subspecies of 43. Their list has been modified by the deletion of some species, such as *Crotalus semicornutus*, and by altering the status of others, such as placing *Lampropeltis knoblochi* as a subspecies of *L. pyromelana*. A number of genera and species have been added so that there are now at least 28 genera and 51 species plus an additional 6 subspecies.

To understand the serpent fauna of Chihuahua, it became necessary to review specimens from those states (Mexican and United States) adjoining Chihuahua (Sonora, Sinaloa, and Durango and Texas, New Mexico, and Arizona). The strategic location of Chihuahua lends itself well to the reception of numerous species into diverse habitats within the state, which necessitated this review. Throughout Chihuahua there are only a few species and subspecies that may be considered endemic to the state. Several of these inhabit the mountainous area of western Chihuahua and represent subspecifically distinct linear extensions of species into the narrow mountainous corridor.

In an attempt to understand such species as *Thamnophis rufipunctatus*, which extends throughout Chihuahua and into the adjoining states to the north and south, I have taken the liberty to investigate again the basic characteristics of this wide-ranging species and to interpret, from the data available, the variations in the populations as I have encountered and understood them. It should, therefore, be understood that where deemed necessary consideration is given to the geographical overlap of adjacent populations of various species and subspecies.

Family Leptotyphlopidae

Two species of the genus *Leptotyphlops* have been found in Chihuahua. The first one treated below was reported by Cope (1879) from a collection made by Edward Wilkinson, Jr., at Batopilas, a small mining town located on a tributary of the Río San Miguel, itself a tributary of the Río El Fuerte (see Smith and Mittleman 1943, 1944, Cope 1896, 1900). Except for the summer rains, this area is dry and slopes to the southwest (Goldman 1951).

The second record was recently reported by Murphy (1975) from 5 km (3 mi) NW of Chilmahma, a suburb of Chihuahua City. We have collections from 9 to 11 km (6 to 7 mi) NW of Chihuahua City and from Colonia Juárez. The area northwest of Chihuahua City is an eastward-sloping alluvial plain, strewn with rocks and with rocky hills extending onto the plain from the higher hills to the west. Specimens were taken in late July and early September from under rocks while the soil was moist. Those taken at Colonia Juárez were collected by children in the school yard. Presumably all specimens were on the surface and all were collected during April and May, which is usually the dry season.

The species of *Leptotyphlops* apparently inhabit the foothills on the eastern edge of the Sierra Madre Occidental. The records now available suggest that a comparatively narrow area, extending from north (Colonia Juárez–Casas Grandes) to south (Chihuahua City–Cuauhtemoc) and undoubtedly on southward, supports worm snake populations. In these foothills, we have worked numerous sidehills and driven numerous hours night collecting, with only limited success. What is seemingly true for the eastern foothills is also apparently the case for the western foothills. In the west, however, the foothills are mostly in the states of Sonora and Sinaloa, so the only suitable habitat in western Chihuahua is on the edge of the low river valleys of the Río Fuerte and its tributaries.

Leptotyphlops humilis dugesii (Bocourt)

Catodon dugesii Bocourt, 1881, Bull. Soc. Philom. 7(6):81. Colima, Mexico.

Leptotyphlops humilis dugesii Klauber, 1940a. Trans. San Diego Soc. Nat. Hist. 9:129.

No specimen from Chihuahua is available. The listing of this subspecies is based on the report of Cope (1879), reiterated by Klauber (1940a), of a specimen from Batopilas in southwestern Chihuahua. Bogert and Oliver (1945) reported a specimen from Alamos, Sonora, and Hardy and McDiarmid (1969) listed several records for Sinaloa. It is thus suspected that if specimens are taken along the Río Fuerte and its tributaries they would be *L. h. dugesii* (Hahn, 1979a).

In 1966, we received three specimens (BYU 23913–15) of this subspecies from 15.9 km (9.4 mi) W of Autlán, Jalisco. The following scale characters are significant: 14 rows around body, 12 rows around tail, 212–236 in dorsal row, prefrontal a little longer than the frontal but not wider, 5th dorsal enlarged and wider than other dorsals. There are 7 rows of dorsals with heavy pigmentation.

In contrast to the data presented by Klauber (1940a), there are fewer dorsals, 212–236 (Klauber gives 235–257), and the enlarged prefrontal may be unique to the western *humilis* subspecies. These specimens extend the lower extreme in the dorsals and indicate that total variation in the cline for the dorsals in *humilis* may be as much as 100 scales, with the known range 212–309.

A specimen from west of Autlán (BYU 23914) was preserved with its mouth fully opened. There are only 3 infralabials on each side of the mental (Fig. 2A), and the 2nd and 3rd infralabials are pigmented nearly as heavily as the lateral and dorsal head scales. The other two specimens have the mouth closed but do show some pigmentation on the same scales. I have noted this pigmented characteristic in no other specimens of *humilis*.

The color pattern in the Jalisco specimens shows 9 rows of dorsals with dark brown pigmentation, 7 rows completely pigmented, and the 2 adjoining lateral rows with half the scales pigmented.

Leptotyphlops humilis chihuahuaensis, n. subsp.

HOLOTYPE.—BYU 17000, adult male from 10.7 km (6.7 mi) NW of Ciudad Chihuahua (west of Highway 45), collected by W. W. Tanner and W. G. Robison, 21 July 1960.

PARATYPES.—BYU 15211 and 16999, topotypes; MVZ 57331, 5 km (3 mi) NW of

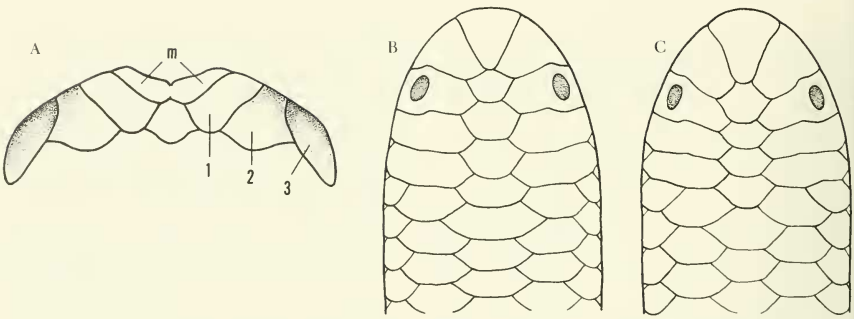

Fig. 2. A, Lower lip of *Leptotyphlops humilis dugesii* in specimen BYU 23914. M = mental, 1-2-3 lower labials. B, Dorsal head scales in BYU 23929, same subsp. C, Dorsal head scales *L. h. chihuahuaensis*, BYU 17000.

Chilmahma, a northwestern suburb of Chihuahua City, Mexico.

DIAGNOSIS.—A subspecies of *L. humilis* having only 10 scale rows around the tail, whereas all others, except *h. segregus* and probably *h. tenuiculus*, have 12. From *L. h. segregus* it is distinguished by having a low number of dorsal scales (253–257), and the first 4 dorsals of approximately equal size, the 5th greatly enlarged (compare Figs. 2B and C).

DESCRIPTION.—Body cylindrical, head only slightly if at all distinct from body, tail slightly reduced and with the characteristic terminal spine. Snout rounded and extending beyond the lower jaw. From the ocular caudad the head merges into the body with no apparent deviation, so that from a dorsal view the head is not distinct from the body. The longest specimen (the type) is 158 mm in total length, with a tail of 19 mm from tip of spine to posterior edge of the vent. The paratypes are 133 and 112 mm, respectively, in total length, with tail lengths of 8 and 6 mm.

The body has 14 rows of smooth, imbricate scales, uniform in size except for those on or near the head. There is a reduction to 12 rows a few scales anterior to the vent, and a final reduction to 10 rows at or just posterior to the vent. The anal scale is single and triangular in shape. The middorsal scale count is 253, not counting the rostral and tail spine. There are 17 subcaudals in the type. The paratypes, both females, have 256 and 257 dorsals and 16 and 17 subcaudals.

The rostral curves over the snout between the 2 large nasals to contact the prefrontal, which is in contact laterally with the nasals and oculars and posteriorly with the frontal. Nasal is divided through the nostril, with the upper nasal largest and the lower nasal forming the lateral edge of the snout between the rostral and first supralabial. Ocular large, extending from lip to contact the prefrontal and frontal dorsally, eye spot near middle of scale and above the level of the nostril. Posterior supralabial large, narrowing dorsally to contact the parietal below the level of the eye. Parietals and occipitals are elongate scales extending from the dorsals laterally to be partially separated by the temporal, wedging between them at their lateral ends. The first 4 dorsals are of approximately the same size, with the lateral edges forming nearly straight lines to the 5th dorsal, which is much enlarged laterally and is the largest scale in the dorsal series.

The mental is broad and narrow, joined laterally by 3 infralabials on each side, with the posterior scale the largest; a single chin shield contacts the mental and divides the first infralabials.

The middorsal scale row and the three adjoining lateral body and tail rows on each side are finely pigmented, but the next lateral rows show a reduction of pigmentation near the middle of each scale and the ventral 1/4 to 1/2 of the scale row without pigmentation. This color pattern extends from the head posteriorly to the tail spine. Below the dorsal pigmentation the sides and ventral scales are light cream or a light buff.

REMARKS.—The relationship of *chihuahuaensis* is with *segregus* primarily because of the 10 rows of scales on the tail and its

geographical nearness. The occurrence of *segregus* in south Texas and adjoining eastern Coahuila, and the fact that the Chihuahua basin (type locality) lies in the drainage of the Río Conchos, which drains to the Rio Grande in southwest Texas, supports this assumption. These facts suggest that these two subspecies had a common ancestry. Whether the desert areas of eastern Chihuahua and western Coahuila have served as an isolation barrier is as yet unknown, since no specimens are available and little collecting has been done in these areas. Hahn (1979) cites two localities (on map) for Chihuahua. The one from central Chihuahua must be from 5 km (3 mi) NW Chilmahma (Murphy 1975). The one from south central Chihuahua may also belong to this subspecies.

A specimen of *segregens* from Coahuila, Mexico (USNM 93593), has 286 ventrals, 12 caudals, prefrontal larger than frontal and interparietal, and the 5th dorsal enlarged. Klauber (1940a) lists the dorsals for *segregus* as 261(271)275; a larger series from Coahuila would probably increase the known average for dorsals and add credence to the uniqueness of the Chihuahua population.

In preserving the type of *L. h. chihuahuaensis*, the mouth was opened so that the infralabials were exposed. In most preserved specimens the mouth is closed and the lower lip scales are partially, if not entirely, covered. This is particularly the case for the most posterior infralabial scale. In most of the literature (Klauber 1940a, Taylor 1939c) I have found a listing of 4 infralabial scales. Klauber believes there are 4 in *L. h. segregus* and other subspecies of *humilis*. Murphy (1975) also lists 4 for *h. lindsayi* and *h. levitoni*, stating that the first lower labial is very small. I have not seen Murphy's specimens, but those *humilis* available to me do not have a small scale by the mental. In fact, there appears to be but 3 infralabials in *humilis*, with the 3rd, the largest, wedged back to the corner of the mouth and with only the lower edge exposed when the mouth is closed. One or two scales may appear to be infralabials, but they contact the larger 3rd infralabial beneath the large, overlapping posterior upper labial and do not reach the inner margin of the lip. A *humilis* specimen from Jalisco (BYU 23913) was in pre-ecdisis condition, and the scales from around the lower lip were removed intact. After staining in eosin to show more clearly the sutures between the scales, it was apparent that there were only 3 scales on each side of the mental. Other *humilis* specimens were examined with the same results. The mental scale is grooved on each side, giving the appearance of a small lateral scale, but I could not see any suture to indicate an additional scale.

During preservation, the hemipenes of the type were everted. They are elongate tubular structures without spines, but with numerous grooves and irregularities.

Leptotyphlops dulcis supraocularis, n. subsp.

HOLOTYPE.—BYU 30426, an adult taken at Colonia Juárez, Chihuahua, México, by Virginia and Herman Hatch during April 1965.

PARATYPES.—BYU 1421, 19131, 30427–28, and 32417, topotypes.

DIAGNOSIS.—A subspecies of *L. dulcis*, with the anterior supralabial divided as in *dulcis dissectus* but differing from *dissectus* in having the supraoculars elongate and wedging between the prefrontal and frontal to enclose or nearly enclose the prefrontal. The interparietal (3rd scale in dorsal row) is much larger than either the frontal (2nd) or the interoccipital (4th) and is approximately equal in size to the enlarged 5th scale. Prefrontal noticeably larger than frontal. The occipital is not divided.

DESCRIPTION.—The body is cylindrical from head to tail. Head only slightly distinct from body, with the snout slanting forward and downwards, beginning at about the prefrontal. Tail short and terminating in a sharp spine. Total length 219 mm, snout-vent length 208 and tail length 11 mm. The topotypes range in total length from 105–257 mm. The ratio of the body length (S-V) to the midbody diameter in four specimens averages .02. The tail length is approximately 5.0% of the total length.

There are 14 rows of smooth, imbricate scales on the body from just posterior to the occipitals to about 5–7 scales anterior to the vent, where the rows are reduced to 12; just posterior to the vent the rows are reduced to 10 on the tail. The anal is single and triangu-

lar, followed by 14 subcaudals that range in the paratypes from 13 to 15. There are 237 middorsal scales, beginning with the prefrontal and counting to, but not including, the tail spine. Type and paratype series range from 231(238) to 246.

The rostral is the largest head scale and curves from the underside of the lip dorsally and posteriorly to contact the prefrontal at about the level of the eye. The rostral is only slightly narrowed from the snout between the nasals and has a rather broad, rounded contact with the prefrontal. On the upper lip are 5 scales extending posteriorly from the rostral: nasal, divided through the nostril to form an upper and a lower scale; first supralabial, divided into 2 scales by a vertical suture; ocular, with the eye spot just above the level of the nostril; and a large posterior labial that overlaps the posterior infralabials. Of this series, only the rostral, nasal, and ocular contact the dorsal head scales.

The supraoculars are elongate (Fig. 3), extending from their contact between the nasal and ocular posteriorly and medially to contact the parietal and to wedge between the prefrontal and frontal. In two paratypes, the 2 supraoculars are in contact, thus separating the frontal and prefrontal. The supraoculars are about the same size as the prefrontal, which is larger than the frontal; the interparietal is larger than either the frontal or interoccipital, and approximately equal in size to the 5th dorsal. In none of the series are the first 4 dorsals of about equal size. From smallest to largest they are: frontal-interoccipital-prefrontal-interparietal. The 5th dorsal is enlarged and is equal in size to the interparietal or slightly larger.

The mental is broad and short with 3 infralabials on each side. The posterior infralabial is large and extends under the overlapping posterior supralabial to the corner of the mouth. A scale just posterior and lateral to the posterior infralabial appears to be a 4th infralabial. It is overlapped by the supralabial so that its true relationship to the 3rd infralabial and the lip cannot be seen as it joins the posterior infralabial, but it does not reach the lip.

COLOR PATTERN.—The 5 dorsal rows of scales are finely pigmented, and the dorsal edges of the adjoining rows show some pigmentation. The snout, including the most

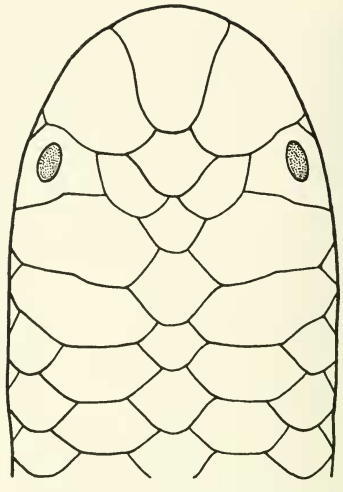

Fig. 3. Dorsal head scales of *Leptotyphlops dulcis supraocularis* (BYU 30427).

anterior part of the rostral and extending laterally to include the area surrounding the nostril, is not pigmented. Those parts of the rostral, nasal, and ocular that are pigmented have small papillae, but these do not appear on the nonpigmented areas. Those scales on the lateral and ventral parts of the head and body are not pigmented.

REMARKS.—An attempt to key the Chihuahua specimens (Klauber 1940a, Taylor 1939c) did not satisfy the key characters. The supraoculars were shaped more as in *L. albifrons* than in the figures by Klauber (1940a) and *dissectus* specimens available. In fact, the first specimen collected in Colonia Juárez (1959) had the supraoculars completely separating the prefrontal from the frontal, and the occipitals are not divided. As additional specimens became available, it was obvious that this supraocular character was apparently unique and not represented in either *d. dulcis* or *d. dissectus*. A comparison of Figure 2 with those presented by Klauber (1940a) illustrates this basic difference in the dorsal head scales.

I have not examined as many specimens from Texas, New Mexico, and Arizona as did Klauber; however, those seen from southern Texas are *dissectus* as described by Klauber.

A specimen from 4 km (2.5 mi) NW of Glenwood, Catron County, New Mexico, has approximately the same head characters as the Chihuahua series except that the interparietal is not greatly enlarged. Although this locality is northwest of the type locality of *L. dulcis dissectus* (near Lake Valley, Sierra County, New Mexico), it is west of the Continental Divide and in the Gila River drainage.

A specimen from Thatcher, Graham County, Arizona, has characteristics of *dissectus* and *supraocularis*; that is, the supraoculars are elongate, but the occipitals are divided and the interparietal is not greatly enlarged.

The terrain favors intergradation of the populations in southwestern New Mexico, southeastern Arizona, and the area directly south in northwestern Chihuahua. Specimens in Arizona and New Mexico west of the Continental Divide are thus expected to show intergrading characters between *d. dissectus* and the Chihuahua subspecies *d. supraocularis*, particularly those representing populations from the Gila River drainage to the west, and from the desert ranges to the south and into extreme northwestern Chihuahua.

A specimen (KU 44264) from Rancho San Francisco in the extreme northwest corner of Chihuahua has all the characteristics of *dulcis dissectus*. The prefrontal is noticeably smaller than the frontal, and the supraoculars are equal in size to the prefrontal and not elongate and thus permit a wide contact between the frontal and prefrontal. This may be the specimen cited (map) by Hahn (1979b).

A specimen (BYU 41893) from Monterrey, Nuevo Léon, is heavily pigmented, with the dorsal rows dark brown and the more lateral and ventral scales a light slate color. The supraoculars are not curved to enclose the prefrontal, and the following scales (frontal, supraoculars, interparietal, and interoccipital) are of approximately equal size. There are 230 dorsal scales, and the prefrontal is the smallest of the series.

Small series of *d. dulcis* (19), *d. dissectus* (15), and *d. supraocularis* (7) provide the following data for the dorsals: *d. dulcis* 212(224)239; *d. dissectus* 206(229.35)239; *d. supraocularis* 231(237.7)246. There is overlapping in all subspecies; however, a cline is evident from east to southwest.

Family Colubridae

The colubrid fauna of Chihuahua is large and diverse primarily because of the many different habitats existing from the deserts to the foothills and into the mountains. This diversity increases the number of available ecological niches and supports a home for 24 genera and at least 40 species, with 5 additional subspecies in the state. Although the greater part of the state has been traversed by collectors and a number of collections made other than those of which I have been a participant, there are yet additions to be made to this large and interesting fauna. In view of the limited collecting in the desert areas east of Highway 45 and in the rugged barranca terrain in which the west coastal thorn forest has invaded the deep canyons, these areas undoubtedly contain additional genera and species for the state of Chihuahua. *Salvadora g. bairdi*, among others now occurring in northeastern Sinaloa but not yet reported for Chihuahua, may occur there.

The colubrid fauna of Chihuahua is composed of genera and species with strong affinities to the desert habitats that surround the state to the east, north, and northwest, permitting an invasion to occur from the deserts into eastern and northern Chihuahua and a major movement of the central Mexican species through the mountains from the south into the western highlands. It is important to note the species and subspecies that inhabit the central plains and foothills, extending from the area near Nuevo Casas Grandes south along the eastern foothills to the state of Durango. In this area some species and subspecies appear to have been isolated since the recent Pleistocene. This isolation has been intensified by the persistence of the desert areas to the north and east, and in turn these desert areas, extending as they do through northern Chihuahua into southern Arizona and New Mexico, have limited the northern movement of the montane species such as *Thamnophis melanogaster* and *Storeria storerioides*. Therefore, one investigating the colubrid fauna of Chihuahua should take into account more than the great diversification of the habitats resulting primarily from changes in elevation from the northeast to the southwest. The geological past has contributed to

the changing habitat conditions and has resulted in some isolation as well as permitting certain species to expand their ranges into the various ecological areas in western and southwestern Chihuahua.

Arizona elegans expolita Klauber

Arizona elegans expolita Klauber, 1946, San Diego Soc. Nat. Hist. 10(17):340–343.
2.2 mi SE N. Casas Grandes, 1 (BYU 15254).
Tinaja Valley, 2 mi S of highway, 2 (BYU 13899, 14334).
1 mi S Sueco, 1 (BYU 17105).
3 mi W Galeana, 1 (BYU 17106).
17 mi N Chihuahua City, 4 (BYU 15293, 15299, 15342, 15346).
10 mi S Chihuahua City on Route 45, 1 (BYU 32041).
12 mi S Los Nieves, Durango, 1 (BYU 14073).
7.4 mi N Moctezuma, 1 (UTEP 4099).
12 mi from Chihuahua City, 1 (MVZ 43656).
1 mi W Ojo de Laguna, 1 (MVZ 73030).
20 mi SE Ciudad Camargo, 1 (MVZ 80001).

The original description cited a type and two paratypes (not examined). With the present series and including data for the types, 17 specimens are available for study.

In all, scale and color patterns, range, and variation in scalation have been increased, although the averages are not appreciably changed.

The scale rows at midbody are 27 in all except one specimen from 27 km (17 mi) N Chihuahua City with 26 rows. The variation occurs anteriorly with 25–29 rows and before the vent with 17–20 rows. Two rows adjacent to the ventrals have larger (wider) scales than those near the dorsum. The head scales show little variation: supralabials 8-8, infralabials 12 or 13, loreals 1-1 except for one with 1-2, preoculars 1-1, postoculars 2-2, and temporals 2-3 or 2-4. Ventrals range from 192 to 207. The males are 192–203, and females 198–207. Caudals are 39–51, with males 50–51, and females 39–49. When ventrals and caudals are combined for males (246.8) and females (247.3), the averages are nearly equal. The total length/tail length ratios were: males 14.2, 14.6, 14.7, 14.8, and 15.1; females 12.7, 13.8, and 13.9. The male from Durango is 15.0.

The color pattern consists of a series of irregular dorsal brown spots ranging from 44 to 54 (47.74) on the body, and from 15 to 23 (18.25) on the tail. Between the darker dorsal spots, the scales are flecked with brown on a cream background. Between the dorsal spots and the ventrals is a row of small spots alternating with the dorsal spots. The ventrals and caudals are without any spots or flecks.

This subspecies, based on available records, occurs in the valleys and foothills east of the Sierra Madre Occidental into the desert valleys at least a short distance east of the main highway (45) and south from north central Chihuahua into Durango. Banta and Leviton (1961) report a DOR specimen from 1.6 km (1 mi) S Juan Batista, Aguascalientes, 12 September 1957, and Dixon, Sabbath, and Worthington (1962) report 4 male specimens from 9 to 32 km (6 to 20 mi) SE of Nombre de Dios, Durango. These have ratios, tail to total length, of 12.4% to 13.6%. If there is justification for recognizing the subspecies *australis*, it is not supported by the northern Durango specimen. The specimen from 19 km (12 mi) S of Los Nieves, Durango, is near the mean for the Chihuahua series in all characters, and is thus considered to be an extension of the Chihuahua population into Durango.

Dixon and Fleet (1976) have mapped the approximate distribution of this species in Chihuahua; also, they show *A. e. elegans* in northeastern Chihuahua and *A. e. philipi* occurring in extreme north central Chihuahua. Two specimens (BYU 15431-2) of *philipi* 5 km (3.4 mi) N of Columbus, New Mexico, are similar to the Chihuahua series in scalation but differ in color pattern with 61 and 64 dorsal body spots.

Conopsis nasus labialis Tanner

Conopsis nasus Günther, 1858, Catalogue of the snakes in the British Mus., p. 6.
Conopsis nasus Taylor & Smith, 1942, Univ. Kansas Sci. Bull. 28(2)15:329–333.
Conopsis nasus labialis Tanner, 1961, Herpetologica 17:13–18.
2 mi SE Creel, 4 (BYU 14295–8).
1 mi W La Laja (6 mi E of Majorachic), 2 (BYU 16854–5).
22.5 mi SE Creel, 1 (BYU 16952).
25 mi SE Creel (by La Bufa Road), 7 (BYU 16856–62).

Since the report of Tanner (1961), no additional data on scale and color pattern variations have been obtained. A field note reference to their habitat is as follows: south of

Creel these snakes were found under rocks in moist to wet soil and in the crumbled volcanic gravel. Some were taken under loose rocks at the base of a small ledge from which water was issuing, keeping the base materials wet. In this area, three small individuals were taken, each of which showed large umbilical scars, suggesting that they were recent hatchlings (total length 101–124 mm), recorded 18 July 1960.

Diadophis punctatus regalis Baird and Girard

Diadophis regalis Baird and Girard, 1853, Cat. N. Amer. Rept. Pt. I, p. 115.
Diadophis punctatus regalis Gehlbach, 1965, Proc. U.S. Nat. Mus. 116:300–307.
10 mi W San Francisco del Oro, 1 (BYU 14251).
Approximately 2 mi E Cerocouhui, 1 (BYU 14243).
Yepomera, 2 (UAZ 34398 and 34792).

Only two specimens were taken in the years we worked Chihuahua, and these seemed to have come from very different populations. The one from San Francisco del Oro lacks a light neck ring and has a very high ventral count (243); the specimen is otherwise very similar to the *regalis* specimens I have seen from New Mexico, Arizona, Utah, and Nevada. This female specimen was taken alive as it crossed a road, along the margins of which were numerous boulders. Gehlbach (1965) placed it in with the subspecies *regalis*.

A second specimen from Cerocouhui is very different, with a wide neck ring and only 195 ventral scutes. The two specimens are from approximately the same latitude but on opposite sides of the Sierra Madre Occidental. The latter specimen is a male, and this may account for some of the differences in the number of ventral scutes; however, a difference of 48 seems a rather wide margin to retain it in the same subspecies.

Although I have not attempted to examine a large series (27 specimens) of the subspecies *regalis*, the Cerocouhui specimen does not fit the basic color and scale patterns I have come to associate with the *regalis* populations in Idaho, Utah, and Nevada. Furthermore, in southwestern Chihuahua it is associated with the high mountainous habitats extending southward through Durango and into central Mexico. These areas do not provide the same foothill or xeric conditions I have associated with the subspecies *regalis*; for this reason, it seems that the *dugesii* subspecies may well extend as far north as the high mountain habitats of southern Chihuahua. This geographic pattern would be in keeping with the distribution of several other species that have extended their range northward throughout the high mountain habitats from Durango and into south and south central Chihuahua. It is more logical to include it in the subspecies *dugesii*. Gehlbach (1965) considered it a *regalis-dugesii* intergrade.

The Cerocouhui specimen was taken after heavy rains in a boulder-strewn alluvial fan at the mouth of a small canyon and was taken in company with *Eumeces callicephalus*, *Crotalus lepidus klauberi*, and the Hylactophrine frog *Eleutherodactylus tarahumaraensis*. If it is indeed a representative of *D. p. dugesii*, it not only represents an extension of its range but also a new record for Chihuahua.

The two female specimens taken at Yepomera have wide distinct nuchal collars but were similar to the specimen from San Francisco del Oro in scalation (ventrals more than 240). Since *regalis* may or may not have a nuchal collar, these specimens are, on the basis of scalation, retained in the subspecies *regalis*. Eleven male specimens (at BYU) from southwestern United States (states listed above) and Chihuahua have the following ventral and caudal counts: ventrals 211(215.2)222, caudals 69(74.5)81; 15 females, ventrals 219(231.1)243, caudals 57(66.4)72. There is an indicated clinal increase from north to south if the Cerocouhui specimen is excluded.

Drymarchon corais rubidus Smith

Drymarchon corais rubidus Smith, 1941a, Jour. Wash. Acad. Sci. 31(11):474–476.
Hardy and McDiarmid, 1969, Univ. Kansas Publ. Mus. Nat. Hist. 18(3):159–160.
Approximately 2 mi S Urique, near river, 1 (BYU 14245).
Along San Miguel River, just below Arroyo Ciénega, 1 (BYU 23708).

Smith (1941a) reported the type series as having the ventrals ranging from 190 to 203, and the caudals as 69–78. Hardy and McDiarmid (1969) reported the range in ventrals as 187–197 for 17 specimens from Sinaloa. The two Chihuahua specimens (both males) have 199 and 196, respectively, in ventrals, and one has 72 caudals. In both specimens there are 8-8 supralabials; however, one (23708) has 9-9 infralabials, and in both the 6th supralabial contacts the 1st lower temporal but is widely separated from the lower

postocular. Both are adult males measuring 1457 and 1987 mm in total length, with the latter having lost approximately half of its tail.

The color pattern is more nearly as described by Smith (1941a) for the type series; that is, the dorsum is black and the head markings are essentially the same color. One difference is noted: the ventrals anterior to those that are black have the posterior edge in black. This black edging becomes thin anteriorly until the median divides, leaving thin, dark margins extending laterally along the edges of the ventrals to within 15–20 ventrals before the gulars. The ventral color of the specimen from the San Miguel River is a deep, almost ruby, red. The Urique specimen was a salmon pink (Tanner and Robison 1960).

This is another extension of the coastal thorn forest fauna extending its range into the deep valleys of southwestern Chihuahua. McCranie (1980) lists a record for southwestern Chihuahua.

Elaphe guttata emoryi (Baird & Girard)

Scotophis emoryi Baird & Girard, 1853, Smithsonian Institution, part I, p. 157.

Elaphe guttata emoryi Dowling, 1952, Occ. Papers Mus. Zool. Univ. Michigan 540:2.

12 mi SE Nuevo Casas Grandes, 1 (BYU 13918).

11.7 mi W Ricardo Flores Magón, 1 (BYU 15347).

The scale and color patterns are normal for the subspecies, and the distribution is within the limits established by previous reports. Both specimens are males with 204 and 208 ventrals; one (14547) has 74 caudals, and the dorsal body spots are 43 and 37, respectively.

In spite of extensive collecting in the area, only two specimens were found. This is surprising, since none were seen as DOR specimens on roads. We attempted not only daytime collecting along roads in the valleys or on the hillsides, but we also did considerable road running during the evenings and early mornings. We have concluded that this is either a rare or very secretive species of Chihuahua.

Elaphe subocularis (Brown)

Coluber subocularis Brown, 1901, Proc. Acad. Nat. Sci. Philadelphia 53:492.

Elaphe subocularis Stejneger and Barbour, 1917, Checklist, p. 84.

Elaphe subocularis Worthington, 1980, Cat. Amer. Amph. and Rept., p. 268.

12 to 39 mi NE Aldama on Chihuahua Road 16, 9 (Carnegie Mus. Nat. Hist. 59917–23, 49926 and 61792).

18 mi SE Ciudad Chihuahua, 1 (NMMZ 9307).

17.7 mi E Coyame, 1 (TCWC 44005).

The distribution of this species in Chihuahua is far from being fully understood. The present records place it primarily in the eastern part of the state; however, some records from central Chihuahua indicate that it could occur in much of the lower foothills and ranges lying east of the Sierra Madre Occidental.

We did not collect east of Highway 45, and the records listed above (kindly provided by Dr. Richard D. Worthington) are all from localities east of the highway.

Elaphe triaspis intermedia (Boettger)

Coluber triaspis Cope, 1879, Proc. Amer. Philos. Soc. 18:261–277.

Pityophis intermedius Boettger, 1883, Ber. Offenbach. Ver. Naturk 22/23:148.

Elaphe triaspis intermedia Mertens & Dowling, 1952, Senckenbergiana 33:201.

I am aware of only one specimen from Chihuahua, previously reported by Taylor and Knobloch (1940), and now number 17681 in the University of Illinois Natural History Museum.

Based on the records reported for Sonora (Bogert and Oliver 1945) and Sinaloa (Hardy and McDiarmid 1969), this species is obviously more common in the western lowlands than in any part of western Chihuahua. Its occurrence at or near Majorachic is undoubtedly the extreme eastern extension of its range and represents another species that has ascended the valleys of the Río Fuerte, this time via its western tributary, the Oteros.

Geophis aquilonaris Legler

Geophis aquilonaris Legler, 1959, Univ. Kansas Publ. Mus. of Nat. Hist. 11(4):327–334.

Maguarichic, 2 (BYU 16912, 16913).

Both specimens (females) were taken 13 July 1960. One was underneath a rock, and the other was taken as it moved in leaves under low growing shrubs. When the speciman was collected, the ground was wet and the temperature hot and humid.

The scalation and color pattern are generally within those of other *G. aquilonaris*, but a few counts extend the known variation (Legler 1959). One specimen (BYU 16912) has only 170 ventrals but 66 caudals. Thus, the ventral range for females is now 170–183 and the caudals 55–66. The color pattern is within the limits previously described for the species.

Gyalopion canum Cope

Gyalopion canum Cope, 1860, Proc. Acad. Nat. Sci. Philadelphia 12:241, 243.

Ficimia cana Garman, 1883, Mem. Mus. Comp. Zool. 8(3):82.

Gyalopion canus Leviton & Banta, 1960, Occ. Pap. California Acad. Sci. 26:1–4.
5.5 mi NE of Colonia Juárez, 1 (BYU 15257).

Scalation and color pattern as reported by Cope (1900). Ventrals 138, caudals 30, scale rows 17. The specimen was taken on a warm and humid night about 10:00, just after a light rain, 3 September 1959 on the road between Colonia Juárez and Casas Grandes. When the specimen was picked up, it produced several rather loud, sharp, popping noises.

In spite of many hours of night driving during all types of weather, this is the only specimen seen DOR or otherwise. The range is now definitely within Chihuahua and may be expected throughout most of the foothill area on the eastern front of the Sierra Madre Occidental. Hardy (1976) cites (map) a record for central Chihuahua.

Heterodon nasicus kennerlyi Kennicott

Heterodon kennerlyi Kennicott, 1860, Proc. Acad. Nat. Sci. Philadelphia 12:336.

Heterodon nasicus kennerlyi Cope, 1900, Ann. Rept. U.S. Nat. Mus. 1898:773. Smith 1943. Proc. U.S. Nat. Mus. 93(3169):432–433.
Tinaja Valley, 1 mi S of highway to Colonia Juárez, 7 (BYU 13900, 14315, 15337, 15816, and 16106–8).
3 to 5 mi SE N Casas Grandes (along highway), 4 (BYU 15250, 17101, 17103–4).
54 mi S Juárez City, DOR on Highway 45, 1 (UTEP 4696).

Smith (1943) lists three specimens from the following localities: Progreso, 27 km (17 mi) W Carmen, and Corralitos.

The scalation and color pattern are not different from those provided by previous authors. In all, there are 23-23-19 scale rows; 131–146 ventrals, males 131–136, females 139–146; caudals 29–40, males 37–40, females 29–33.

Smith (1943) lists a specimen for Tlajualilo, Durango. This indicates that the range in Chihuahua undoubtedly extends south throughout the desert valleys of central Chihuahua. We were fortunate to have half our collection given to us by Mr. Herman Hatch, who found them in his cultivated field a mile east of Colonia Juárez. The only specimens we found were on or along the highways.

Once arriving in the Colonia Juárez/Casas Grandes area and letting it be known that we were interested in reptiles, we were introduced to a number of snake stories. One concerned the species at hand. It was referred to as a deadly adder that feigned death only to get you to pick it up or get close enough for it to strike. In 1959 we were fortunate to find a live adult a few miles SE of N. Casas Grandes, and it was possible to demonstrate that it was completely harmless. We soon found that many were afraid of reptiles, and before we engaged any help from the locals, we had to educate them that the only good snake is not a dead one.

Genus *Hypsiglena*

In 1860 Cope described two species of the genus *Hypsiglena*: *ochrorhyncha* from Cape San Lucas and *chlorophaea* from Fort Buchanan, Arizona. Most authors have placed the latter species as a synonym under *ochrorhyncha*, even though there are at least two subspecies geographically between Cape San Lucas in Baja California and the populations in Arizona and northern Sonora. Now that adequate material is seemingly available, it does seem appropriate, on the basis of the ventral counts and combining the ventral-caudal counts and color pattern, that we recognize *chlorophaea* as a distinct subspecies and indicate its description and distribution in central and northern Sonora and in most, if not all, of Arizona. The material from Chihuahua is, in several respects, more nearly similar to the Cape San Lucas population than to the Arizona-Sonora populations.

An analysis of the available material from southern Sonora, northern Sinaloa, and southwestern Chihuahua indicates that intergradation of the *torquata* type (having a light nape band followed by a large, dark band) with the *ochrorhyncha* type (or *chlorophaea*) to the north has produced several head and nape color pattern combinations. It does appear that the light cream band on the nape of the *torquata* material is gradually replaced in the intergrading specimens to the north by forward movement of the broad, dark band, which in turn is responsible in part

TABLE 1. Ventral and caudal variation in *Hypsiglena*.

Region	No.	Sex	Ventrals	Caudals	Ventral-Caudals
Cape San Lucas and environs	13	M	166(170.8)176	42(49.5)53	212(220.5)224
	8	F	173(178.4)188	44(45.8)48	218(225.7)235
Sonora	11	M	161(173.57)189	49(61.6)65	232(238.7)250
	10	F	178(183.8)188	52(55)58	231(238.3)244
Arizona	19	M	175(179.6)193	51(55.7)66	222(230.9)248
	29	F	175(185.2)190	44(47.8)53	223(233.5)241
Chihuahua	4	M	164(168.3)171	48(52.3)56	216(220.7)227
	3	F	170(172.0)175	41(44.2)49	211(216.2)221

for eliminating at least the posterior portion of the cream-colored band. The anterior part of the white band becomes pigmented and spotted like the dorsum of the head. To further reduce the prominence of the light band, a medial dark stripe two or three scales wide extends from the dark band to or within a scale of the parietals, and the orbital stripes are extended caudad to contact laterally the dark nuchal band. The elimination of the cream band is followed by a reduction in the size of the dark nape band, which becomes incised dorsolaterally, and, as the reduction in the length of the dark nape band continues, the dorsolateral indentations separate the nape band into a median spot posterior to the parietals and two lateral spots extending dorsad to the orbit. This intergradation of color pattern is more apparent than perhaps in any other subspecies thus far examined, and is, of course, the criterion that induced Dunn (1936) to suggest only one species existed in the genus.

An examination of 32 specimens from the cape region of Baja California (that is, the area south of La Paz and in the cape area) suggests that the material from the type locality of *ochrorhyncha* and the general area north from the Cape to near the La Paz area represents a population quite distinct from any other in the Baja California peninsula. Specimens taken a short distance north of La Paz show a substantial increase in the number of ventrals and caudals, and a substantial increase in the number of dorsal spots, providing the basic characteristics of the midpeninsular subspecies *venusta*. A comparison of the material in the Loreto/Comondu area to that of the Cape shows an increase of approximately 10–15 scales in the ventrals and an increase of approximately 10 in the caudals, so that a combination of the ventral-caudals results in an average increase in the *venusta* population of 15–20 ventral-caudal scutes. Immediately north of the *venusta* subspecies, in the area of San Felipe and on into the Great Basin area of southern California, Nevada, and Utah, and as far north as British Columbia, the subspecies *deserticola* provides an even higher number of ventrals and caudals, with a combination of the ventral-caudal scutes exceeding 240 scales. Thus, the populations at the cape and those populations in Arizona-Sonora have, until now, been referred to as disjunct populations of *ochrorhyncha*. On the basis of statistical analysis, the Arizona-Sonora populations should be separated and placed in a distinct subspecies. An examination of the Arizona-Sonora populations (85 specimens examined) indicates that the average ventral-caudal scales in these populations range from 232 to 239, in contrast to an average of approximately 220 in the typical *ochrorhyncha* population of the Baja cape. There is also an increase of approximately 10 dorsal body spots in the Arizona-Sonora populations, averaging 57–60 spots in contrast to the 50–52 in the cape population (Table 1). It is thus proposed that the Arizona-Sonora populations be recognized as distinct and placed in the subspecies *Hypsiglena torquata chlorophaca* Cope.

Hypsiglena torquata texana Stejneger

Hypsiglena texana Stejneger, 1893, N. Amer. Fauna 7:205.

Hypsiglena ochrorhyncha texana Stejneger & Barbour, 1917, Checklist N. Amer. Amph. Rept., p. 93.
Colonia Juárez, 4 (BYU 14300–3).
9 mi NE Colonia Juárez, 1 (BYU 15373).
Casas Grandes (in ruins), 1 (BYU 16988).
24 mi E Buenaventura, 1 (BYU 15260).
6.5 mi N Chihuahua City, 1 (BYU 16989).
5 mi N Cerro Campaña, 2 (MVZ 70995–6).

Ojo de Laguna (25 mi S Gallego), 2 (MVZ 73012–3).
16 mi N Durango City, Durango, 1 (MVZ 59299).
0.5 mi S Matachic on highway 16, 1 (UAZ 34420).

The Chihuahua *Hypsiglena* that have, in recent studies, been referred to as part of the *H. t. ochrorhyncha* complex are more comparable in scale patterns to the Baja cape population than to any other subspecies referred to above. For example, the mean ventrals in the males (7) is 168.3 in contrast to the cape males (22) at 170.5. The females are equally similar in that the total of ventral caudal scutes is almost identical in the two populations, as is also the number of dorsal spots in both sexes. However, a comparison of the Chihuahua population samples to a series of specimens from southeastern New Mexico and Texas suggests that the central and eastern Chihuahua material should be associated with the subspecies *t. texana* rather than retained in the subspecies *t. ochrorhyncha* or *t. chlorophaea*. Thus, the *Hypsiglena* of Chihuahua can best be assigned to two subspecies: those east of the Sierra Madre Occidental in the area of Colonia Juárez and south into Durango to *texana*, and those on the west, at least in the Río El Fuerte basin, on the basis of the material now available, to the subspecies *chlorophaea*.

A female specimen (16 mi N Cd. Durango, MVZ 59299) has 174 ventrals and 51 caudals (225 V-C) and should perhaps be included in this subspecies.

Hypsiglena torquata chlorophaea Cope

Hypsiglena chlorophaea Cope, 1860, Proc. Acad. Nat. Sci. Philadelphia p. 246.
Urique, 1 (BYU 14313).

There is a real possibility that the population of the El Fuerte basin in extreme southwestern Chihuahua may also have representatives of *t. torquata*, since adjacent southern Sonora and northern Sinaloa represent the area where intergradation seemingly occurs. I would, therefore, expect to find specimens with the *t. torquata* pattern entering from Sinaloa into southwestern Chihuahua.

The specimen from Urique has a broad, dark, nape band 5 scales long with a median extension of 5 scales to the parietals. At the anterior edges of the dark band (on each side of the median) are light brown areas. This nape pattern is similar to that of a specimen from Colima (BYU 23962) except that, in the Urique specimens, the areas anterior to the dark band and on each side of the median nape stripe are cream colored. This pattern seems to be a further indication of changes in pigmentation pattern that have occurred because of intergradation between *H. t. torquata* and *H. t. chlorophaea*.

Summary for *Hypsiglena*

The taxonomic arrangement of *Hypsiglena*, indicated above, seems the most logical interpretation, based on geographical distribution and statistics. For a long time the Arizona-Sonora-Chihuahua material represented a taxonomic problem. With the material now available, there seems to be little justification for not recognizing Cope's subspecies described from Fort Buchanan, Arizona, in 1860. Averages provide ample key characters to serve the purpose of separating the two widely separated populations.

The climatic changes that have occurred during the last 15,000–20,000 years may have subjected this widely dispersed genus to substantially changing environments. The cape area of Baja California and the Arizona-Sonora area may not have changed as radically as did the area between (that is, central and northern Baja California and the lower regions of the Great Basin). The area thus retains ancestral characteristics in these populations while necessitating a more radical change in the external color pattern and scalation characteristics of the populations in the intervening desert areas. Therefore, the primary difference that has developed in the Arizona–Sonora–southwestern Chihuahua populations has been an increase in the ventral-caudal scutes, with no major alteration in the basic color pattern except for an increase in the number of dorsal spots.

The parameters of intergrading populations are, as yet, not well defined, but general areas as given above can now be indicated. They are as follows:

a. *H. t. torquata–t. chlorophaea*: northern Sinaloa, southern Sonora, and perhaps southwestern Chihuahua.
b. *H. t. ochrorhyncha–t. venusta*: areas near La Paz and immediately north of Bahia de La Paz but not extending far beyond the Arroyo Salado.

c. *H. t. venusta–t. deserticola–t. klauberi*: *venusta* in the area south of San Felipe and along the gulf coastal areas, with more typical *deserticola* ranging northward into southeastern California, and *klauberi* extending westward to the coast and north into southwestern California.
d. *H. t. deserticola–t. chlorophaea*: not as clearly defined, but occurring to a limited degree along the edges of the Colorado River to Glen Canyon Dam.
e. *H. t. chlorophaea–t. texana*: apparently occurring in extreme eastern Arizona, southwestern New Mexico, and northwestern Chihuahua.

Lampropeltis getulus splendida (Baird & Girard)

Ophibolus splendidus Baird & Girard, 1853, Cat. of N. Amer. Reptiles, p. 83.
Lampropeltis splendida Cope, 1860, Proc. Acad. Nat. Sci. Philadelphia, p. 255.
Lampropeltis getulus splendidus Wright & Bishop, 1915, Proc. Acad. Nat. Sci. Philadelphia 67:168.
2.3 mi N Chihuahua City, 2 (BYU 15182–15283).
28 mi W Chihuahua City, 1 (BYU 14138).
Río Santa María at bridge W of Galeana, 1 (BYU 13515).
14.5 mi E Buenaventura, 1 (BYU 15252).
1 mi SW Casas Grandes, 1 (BYU 17691).
7 mi N El Sueco, 1 (UTEP 4018).

Literature citations are for San Diego (Blanchard 1921, AMNH 3752) and Río Santa María and San Diego (Smith and Taylor 1945).

Based on the available records, it appears that this species ranges in the area west of Highway 45, extending west through the valleys and low ranges to the east base of the Sierra Madre Occidental. Records are available from the desert areas of eastern Chihuahua (Reynolds and Scott 1977).

The scale counts of examined specimens are slightly higher than those listed by Blanchard (1921) and are as follows: scale rows 23-23-19 or 23-25-19, with 4 of the 7 having 25 rows at midbody; ventrals 209–217, males 204–213 (210.3), females 210–217 (213.3); caudals 51–58; other variation as previously reported.

Three of the specimens are juveniles and show a decided series of large dorsal spots, clearly divided by narrow, light lines. In the adults, an increase of dorsal dark pigment obscures this spotted pattern. The dorsum of the head and the nape are black, with this pattern extending for 15 scales posterior from the parietals. The ventrals are mostly black, but with light spots on the edges.

There appears to be a strong influence of the subspecies *nigrita* in the specimens I have seen from Chihuahua. Blaney (1977) found intergradation in northern Sonora and south and eastern Arizona. This was based not only on color pattern, but also on the increase of dorsal scale rows to 25 in some specimens. As noted above, 4 of 7 specimens have 25 scale rows, and there is, in live specimens, a decided melanistic color pattern. I do not have enough specimens to establish a zone of intergradation but suggest only that a closeness in basic characters does exist between the subspecies *splendida* and *nigrita*.

Lampropeltis triangulum sinaloae Williams

Lampropeltis triangulum nelsoni Blanchard, 1920 (part), Occ. Pap. Mus. Zool. Univ. Michigan 81:6.
Lampropeltis triangulum sinaloae Williams, 1978, Milwaukee Public Mus., Publ. in Biol. and Geol. 2:167.

A single specimen is available from Piedras Verde, Chihuahua (BYU 22482). This locale is near the junction of the Río Urique and the San Miguel, which in turn is a tributary of the Río El Fuerte.

This is an extension of the known range of *L. t. sinaloae* and represents a new record as well as an addition to the herpetofauna of Chihuahua.

Lampropeltis pyromelana pyromelana (Cope)

Ophibolus pyromelana Cope, 1866, Proc. Acad. Nat. Sci. Philadelphia 18:305.
Lampropeltis pyrrhomelaena Blanchard, 1921, U.S. Nat. Mus. Bull. 114:231–236.
Lampropeltis pyromelana pyromelana Stejneger and Barbour, 1917, Checklist N. Amer. Amph. and Rept., p. 88.
Black Canyon, approximately 8 mi W Chuhuichupa, 1 (BYU 14210).
Top of mountain on road to Pacheco, 2 (BYU 13389 and 19132).
5 mi below Rancho Verde on Río Gavilán, 1 (BYU 32418).
For additional records, see Tanner 1983 (Cat. of Amer. Amph. and Reptiles).

In the northern mountains (north of the Río Papigochic) of Chihuahua is one of several isolated populations of *L. p. pyromelana*. Because of the many mountain islands in the total distribution of this species, we find very little evidence of intergradation between the subspecies. This may also be the result of an incomplete understanding of its distribution, since few specimens are available.

Both Blanchard (1921) and Smith and Taylor (1945) list a specimen from San Diego

(AMNH 3716). In the early days San Diego was an important Rancho. It is located east of Colonia Juárez and south of Casas Grandes, and this is not a montane locality. Those who have seen *pyromelana* report them to be only in the mountains much to the west of Colonia Juárez. I suspect that the San Diego specimen was also taken in the mountains but reported from the then-recognized locality. The scale counts listed by Blanchard for this San Diego specimen are within a few scales of those examined from the mountains to the west.

Specimens reported from Guerrero (Smith and Taylor 1945) and from Yepómera (Van Devender and Lowe 1977) in west central Chihuahua include its range in the Río Papigochic basin. There is a strong indication that *pyromelana* has entered Chihuahua by ascending the tributaries of the Río Yaqui from northwestern Sonora, since both the Bavispe and Papigochic drain the northern and central regions of the Sierra Madre Occidental.

Lampropeltis pyromelana knoblochi Taylor

Lampropeltis knoblochi Taylor, Copeia 1940:253.
Lampropeltis pyromelana knoblochi Tanner, 1953, Great Basin Nat. 13:47–66.
25 mi S Creel (La Bufa Road), 2 (BYU 16864–5).

The only other specimens known are the types from Majorachic (FMNH 23016–17), two specimens from Yecora, Sonora (UAZ 25131 and 28177), and a specimen in the British Museum from Yoquiro, Chihuahua.

This subspecies shows the greatest departure from the basic characteristics of *L. pyromelana*. The color pattern is unique in that the red is not constricted dorsally by the black bands, nor does the red reach the ventrals. Thus, the red is combined to large, dorsal spots surrounded by narrow, black bands dorsally and laterally and by an irregular, light stripe ventrally between the black-edged red blotches and the ventral scales. In the other subspecies the red reaches the ventrals in some or all triads. The length of the triads is shorter than in other subspecies, and thus there is an increase in the number of white bars and/or triads (transverse white bars 63-(74)-85). The white bars terminate laterally by becoming a part of the lateral, irregular, light line; such bars equal or exceed the total number of caudals.

This subspecies is not ringed or banded but has a series of red spots extending across the dorsum from the 3rd or 5th scale rows on each side. There is an increase in ventrals 225–238 and in caudals 64(67)74.

The two specimens taken south of Creel were on a rocky hill above a small stream. Heavy rains the day before left the habitat wet; both were found under rocks.

The distribution of *knoblochi* is not fully known. Those records indicated above are all from the high mountains of southwestern Chihuahua and extreme southeastern Sonora. Since most of the area to the south has not been studied, it is suspected that this subspecies may range south into the Guadalupe y Calvo area and even into northern Durango.

Leptodeira splendida ephippiata Smith & Tanner

Leptodeira ephippiata Smith & Tanner, 1944. Copeia 3:131. Type locality, 13.3 km (8.3 mi) WNW of Alamos, Sonora.
Leptodeira splendida ephippiata Duellman, 1958. Bull. Amer. Mus. Nat. Hist. 114:82.
Approximately 15 mi upstream from Divisadero Trail, Urique River, 1 (BYU 22658).

A juvenile or subadult male 277 mm in total length and with a tail/body ratio of 0.267, less than that reported for juveniles by Duellman (1958) at 0.365. The scale rows are 21-21-17, ventrals 179, caudals 92, supralabials 7-8, infralabials 10-10, preoculars 3-3, postoculars 1-2, loreals 1-1 and temporals 0-2 on right side (with first temporal fused to the parietal) and 1-2 on the left side. The range of the caudals is increased from 78-85 (Duellman 1958) to 78-92 in males.

There are 26 spots on the body, and 20 on the tail. The first body blotch is connected to the nuchal stripe, which extends as a narrow, uniform streak to the posterior tip of the parietals. The area between the parietals and the first body spot is a light cream color, providing a noticeable contrast between the mottled head and the first body spot. The postorbital stripe fades on the posterior temporals and appears only as a stippling from the posterior supralabial on one row of scales to the first body spot. Otherwise, the color and scale patterns are as has been described by Duellman (1958), Hardy and McDiarmid (1969), and Taylor (1939a).

The importance of this specimen is not that it varies appreciably from specimens taken in Sinaloa, but primarily in that it was found at such a distance up the Urique River, suggesting that there may well be a sizeable population inhabiting the Río El Fuerte basin (at least as far as the coastal thorn woodland habitat extends into the barrancas). The specimen had recently eaten an adult *Hyla* and several arthropods, the latter not easily recognized since they were fragmented.

The reduced ratio between body and tail and the increase in caudals suggest that this species, as with others that inhabit the deep, narrow canyons, is sufficiently isolated there to have evolved distinctive variations. This specimen is also a new record for Chihuahua.

Leptophis diplotropis diplotropis (Günther)

Ahaetulla diplotropis Günther, 1872, Ann. Mag. Nat. Hist. 4(9):25–26.

Leptophis diplotropis Günther, 1894, Biologia Centrali-Americana, Rept., p. 130.
Arroyo Cienaga Prieta, approximately 35 mi below Guachochic, 1 (BYU 22484).

A single female specimen represents the first to be taken in the Río El Fuerte basin of southwestern Chihuahua. It has a higher ventral count (188) than specimens examined from nearby Sinaloa as reported by Oliver (1948) and Hardy and McDiarmid (1969). Oliver (1948) also lists four specimens (MCZ 43268–43271) from Guasaremos, Chihuahua, a locale on the Río Mayo. In these, the ventral counts range from 181 to 184. The average of the five available specimens from Chihuahua is 183.4. The ventral counts of Chihuahua specimens (181–188) are similar to those occurring in specimens from the Tres Marías Islands (185–186) and may, therefore, justify the retention of the island population within the nominal subspecies *diplotropis*. Otherwise, the scale counts are approximately the same as those observed by previous authors cited above. The color pattern is as described by Oliver (1948) and as figured by Bogert and Oliver (1945), except that the dorsolateral stripe does not involve the 4th–5th rows and the anterior half of the 7th supralabial.

The scales in the 1st and 8th (middorsal) scale rows are noticeably larger than other scales in the intermediate scale rows. Faint keels occur only on the paravertebral rows of the body, but not on the tail. The differences in the size and shape of the body scales is very noticeable, with rows 3 to 6 on each side elongate, and with a diagonal position in contrast to the other more uniformly positioned rows.

An increase in ventrals and differences in color pattern from south to north in western Mexico is apparent, but whether the northern populations can be considered to be subspecifically distinct from those in southern Sinaloa southward must await a much larger series of specimens.

Masticophis flagellum lineatulus Smith

Coluber flagellum Shaw, 1802, General Geol. or Systematic Nat. Hist., p. 615.

Masticophis flagellum Ortenburger, 1928, Occ. Pap. Mus. Zool. Univ. Michigan 139:2.

Masticophis flagellum lineatulus Smith, 1941, J. Wash. Acad. Sci. 31(9):394.
13 mi S Acensión, 1 (BYU 17102).
22 mi S Gallego, 1 (BYU 13975).
1 mi W Sueco, 1 (BYU 15360).
9 mi W Sueco, 1 (BYU 15339).
2 mi S Sueco, 1 (BYU 42244).
38 mi S Ahumada, 1 (BYU 15340).
3.5 mi E Buenaventura, 1 (BYU 15358).
Colonia Juárez, 1 (BYU 15468).
8 mi NW Colonia Juárez, 1 (BYU 15461).
Lower Tinaja near Colonia Juárez, 1 (BYU 15341).
4 mi NE Colonia Juárez, 1 (BYU 17697).
25 mi N Cd. Chihuahua, 1 (BYU 30381).

Aside from the type (11 mi S of Buenaventura), Smith lists four additional paratype specimens from Chihuahua (USNM 14279, 14283 Chihuahua, and USNM 104675–6, Río Santa Maria, near Progreso). In the UTEP collection are the following: 2519, Sierra del Nido; 3582 0.8 mi NW Zavalza, Durango (near Chihuahua border); 4097, 72 mi N Cd. Chihuahua and 4228, 6 mi NE Janos.

The scale counts are as follows: ventrals, males 194(198.6)201, females 191(193.5)195; caudals, males 98(104.6)113, females 98(98.8)100; scale rows 17 reducing to 12 or 13 before the vent; supralabials 8, and infralabials 9 or 10.

The color pattern does not vary from Smith's (1941) original description. Adult specimens preserved 25 years ago still show the brilliant, deep, salmon-red color. This alone is a remarkable distinction for this subspecies. A few specimens from northern Durango (12 mi S Los Nieves, BYU 14071 and 1 mi N Zarca, BYU 14072) have also retained this unique color and color pattern.

Wilson (1973) indicates by map two and possibly three subspecies in Chihuahua. The subspecies *testaceus* enters northeastern Chihuahua from Coahuila, and *piceus* intergrades with *lineatulus* in the northwestern corner. There is reason to suspect that *cingulum* may occur in southwestern Chihuahua by entering through the El Fuerte Basin. None of the specimens we have taken in central Chihuahua, west of Highway 45, show any intergrading of characters.

Masticophis mentovarius striolatus (Mertens)

Coluber striolatus Mertens, 1934, Zoologica 32:190.
Masticophis s. striolatus Zweifel & Norris, 1955, Amer. Midl. Nat. 54:242.
Masticophis mentovarius striolatus Johnson, 1982, Cat. Amer. Amph. and Rept., p. 295.

Cueva Creek near Tres Rios, 1 (BYU 17112). This locality is just east of the Sonora border and is a small creek draining into the Bavispe River.

This female has the following scale counts: scale rows 17-17-13, ventrals 177, caudals 109, supralabials 8-8, infralabials 9-10, preoculars 2-2, postoculars 2-2, loreals 1-1 and temporals 2-2-3. An examination of specimens from Sonora and those reported from Sonora by Bogert and Oliver (1945) show, from the limited material available, lower ventral counts than those reported from farther south. Hardy and McDiarmid (1969) list the total range for Sinaloa specimens as 178–189. Specimens available to me, and those reported in the literature, give the range in ventrals as 177–195. Scale rows at midbody are 17 and at vent 13. The color pattern is unique in adults, with the dark spots on the tips of the scales forming fine, broken, diagonal stripes across the dorsal scale rows.

Johnson (1977 and 1982) reviewed the taxonomy and distribution of the whipsnake *Masticophis mentovarious* (Duméril, Bibron, & Duméril), recognized five subspecies, and placed *striolatus* as the northern subspecies. The Chihuahua specimen is well within both the scale counts and color patterns provided in the studies by Johnson.

Masticophis taeniatus girardi Stejneger & Barbour

Masticophis ornatus Baird & Girard, 1853, Cat. N. Amer. Reptiles, pp. 102–103.
Masticophis taeniatus ornatus Schmidt & Smith, 1944. Publ. Field Mus. Nat. Hist. Zool. Ser. 29:90.
Coluber taeniatus girardi Stejneger & Barbour, 1917, Checklist, p. 89.
Masticophis taeniatus girardi Parker, 1982, Cat. Amer. Amph. and Rept., p. 304.
48 mi W Ciudad Chihuahua, 1 (BYU 14128).
7.5 mi E Buenaventura, 1 (BYU 15256).
6 mi E Ricardo Flores Magón, 1 (BYU 19134).
Bridge at Río Urique on La Bufa Road, 1 (BYU 22700).
Sierra del Nido, 1 (UTEP 2519).
72 mi N Ciudad Chihuahua, 1 (UTEP 4097).
6 mi NE Janos, 1 (UTEP 4228).

Smith and Taylor (1945) list the range of this species in México as extending north from central Zacatecas through extreme eastern Chihuahua to western Texas. The records listed above indicate that most of Chihuahua may be a part of its range. While on the Río Urique in September 1963, a large specimen was seen approximately four miles downstream from the bridge. Unfortunately it escaped, but it does establish its occurrence in western Chihuahua.

Ortenburger (1928) recognized the subspecies *girardi* and extended the range south from the south central United States through adjoining central and eastern Chihuahua to Guanajuato.

The scale counts are normal for the subspecies. Ventrals range from 199 to 205, the caudals 125 to 168. The single male has 168 caudals, and the females vary from 125 to 147. All have 15 dorsal rows at midbody and 11 or 12 before the vent.

In adults the lateral light stripe fades into the general body color a short distance before the vent. However, in young and juveniles the light stripe is present, extending onto the tail and involving at the vent only the 3rd and 4th rows. The fading of the light stripes in adults is a character distinguishing *girardi* from the subspecies *taeniatus*.

Opheodrys vernalis blanchardi Grobman

Colubes vernalis (Harlan) 1827. J. Acad. Nat. Sci., Phila., 5:361.
Opheodrys vernalis Schmidt and Necker 1936. Herpetologica, 1(2):63.
Opheodrys vernalis blanchardi Grobman 1941. Misc. publ., Mus. Zool. Univ. Michigan 50:11–37.
1.6 mi N Pederhales (24 mi SE Guerrero, on Highway 16), 1 (UAZ 34416).

The occurrence of the green snake is added evidence that the recent past did indeed have

a climate and thus ecological conditions permitting a wide dispersal of many species. The passed distribution of this species must have extended throughout much of the intermountain area from Wyoming, Colorado, Utah, New Mexico, and northwestern Chihuahua. There is reason to believe that its distribution was halted by the deserts of the Great Basin extending from the Snake River in southern Idaho and south through central Utah. The slow desiccation during the last 10,000 to 20,000 years has driven this species as well as others (a good example is *Lampropeltis pyromelana*) into more suitable habitats in mountains (6000 ft) well above the desert valleys. The numerous disjunct areas suggest that there may be other mountainous areas not yet discovered in what appears to have been its past area of distribution.

Oxybelis aeneus auratus (Bell)

Dryinus aeneus Wagler, 1824, Serpentum Brasiliensum Species Novas, p. 12.
Dryinus auratus Bell, 1825, Zool. Jour. 2:324–326.
Oxybelis aeneus auratus Bogert & Oliver, 1945, Bull. Amer. Mus. Nat. Hist. 83:381.
Arroyo Santa Anita, 1 (BYU 22485).
Río San Miguel, 1 (BYU 38338).

These female specimens were taken in the drainage basin of the Río San Miguel in southwestern Chihuahua; it is another species that has entered the state by way of the El Fuerte River basin.

The scale counts are within the limits set forth by Bogert and Oliver (1945) for the species in México; however, the ventrals at 201 and 202 and caudals up to 185 are more than for the Sinaloa female specimens (183–195 and 175–176) reported by Hardy and McDiarmid (1969) but are within the range reported for Sonora (Bogert and Oliver 145:387). On the right side of specimen 22485 there are 2 preoculars, one being formed from a division of the upper posterior (orbital) part of the normal preocular.

These are new records for the state of Chihuahua.

It is obvious that the 1-2 preocular pattern is an anomaly in this specimen. An examination of a few specimens in our collection from Venezuela, Costa Rica, and western México indicates that throughout the greater range of this species the normal preocular formula is 1-1; however, the occurrence of 2 preoculars, as reported by Taylor (1941) in his description of *Oxybelis potosiensis,* may not have been an anomaly. Bogert and Oliver (1945) did not see the type specimen or others from or near the type locality.

Keiser (1970:227) provides a key to the species of the genus *Oxybelis.* His catalogue report (1982) provides a complete synonomy for *Oxybelis aeneus* (Wagler). The map for the species includes the edge of southwestern Chihuahua, but it is not clear as to whether a collecting locality is within the state.

Pituophis melanoleucus affinis (Hallowell)

Pityophis affinis Hallowell, 1852, Proc. Acad. Nat. Sci. Philadelphia 6:181.
Pituophis melanoleucus affinis Smith & Kennedy, 1951, Herpetologica 7:93–96.
2 mi E Colonia Dublán, 2 (BYU 13878–9).
6 mi SE N Casas Grandes, 1 (BYU 15324).
16.4 mi SE N Casas Grandes, 1 (BYU 15359).
23.3 mi SE N Casas Grandes, 1 (BYU 15369).
Eastern limits of Casas Grandes, 1 (BYU 15370).
8 mi NE Colonia Juárez, 1 (BYU 15374).
Galeana, 1 (BYU 15255).
1.5 mi S Galeana, 1 (BYU 15258).
12.5 mi S Galeana, 1 (BYU 15353).
21 mi E Buenaventura, 1 (BYU 15354).
23.9 mi SE N Casas Grandes, 1 (BYU 15355).
2 mi W Sueco, 1 (BYU 42245).
18 mi W Sueco, 1 (BYU 15352).
25 mi W Sueco, 1 (BYU 15336).
Colonia Juárez, 2 (BYU 15430 and 18249).
3 mi S Palomas, 1 (BYU 14651).
4 mi W San Francisco del Oro, 1 (BYU 15378).
1 mi W Chuhuichupa, 1 (BYU 13877).
21.7 N Ciudad Chihuahua, 1 (BYU 15323).
46.7 mi W Ciudad Chihuahua, 1 (BYU 22686).
23.5 mi N Ciudad Chihuahua, 1 (BYU 32042).
48 mi W Ciudad Chihuahua, 1 (BYU 13881).
4 mi E Cuauhtemoc, 1 (BYU 15385).
25 mi E Cuauhtemoc, 1 (BYU 15428).
5 mi W Miñaca, 1 (BYU 17083).
60 mi S Ciudad Chihuahua on Highway 45, 2 (BYU 15772 and 41339).

Aside from the locality records listed above, DOR snakes were seen along Highways 45 and 10 and from Ciudad Chihuahua west to La Junta. Most were badly mashed and were not kept. The records do, however, place this species throughout central and western Chihuahua.

None of the Chihuahua specimens reach the upper limits of the ventrals set by Klauber (1947:220–251). Ventrals range in males from 213 to 232 (225.1); females range from 223 to 238 (228.7). Caudals in males range from 62 to

69 (64.66), and females range from 52 to 61 (55.28). In both sexes the caudal ranges varied less than 10 scales. The range in the ventrals was greater but showed a lower mean than was projected by Klauber for specimens studied from the entire geographical area occupied by *affinis*. In the preoculars, 16 had 1-1, 7 had 2-2, and 3 had 1-2. Postoculars were 3 or 4 in nearly equal numbers, and the scale rows were 29 to 33 at midbody, with 31 rows being the usual number. With few exceptions, the rows at the vent were 23. Sixteen specimens had 8-8 supralabials, with others having 8-9 or 9-9. Infralabials were usually 12-12, but with 12-13 or 13-13 occurring frequently.

The scale counts are generally lower than those obtained from specimens seen from Sonora and areas from the western part of the *affinis* range.

Dorsal spots on the body range from 26 to 56, average 42.7. Klauber lists the range as 34–63 with an average of 48. The male specimen with 26 spots came from the western mountains near Chuhuichupa; its spots are large, round, and without the usual convexity so common in most specimens. The next lowest number is the specimen from Miñaca with 32 spots. Otherwise, the specimens are within the recorded range of variation in scale and color patterns.

Klauber (1947) gives the ratio of the length of the tail to the total length as about 0.136 in males and 0.125 in females. He obtained these ratios from western specimens and states that the more eastern population would have shorter tails. This is not borne out from the smaller series from Chihuahua in which the males range from 0.129 to 0.157 (.143), and the females from 0.120 to 0.144 (.132). Perhaps the present series (29) from Chihuahua is more representative of the eastern populations than material seen by Klauber. His intrasubspecific trends are, except for ratios, seemingly valid; and, yet, an in-depth study of the *affinis* complex, including a more balanced distribution of specimens, would provide a better understanding of the variation in this widely dispersed subspecies.

Rhadinaea hesperia hesperioides Smith

Rhadinaea hesperia Bailey, 1940, Occ. Pap. Mus. Zool. Univ. Michigan 412:8–10.

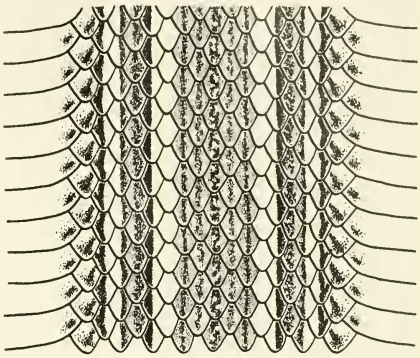

Fig. 4. Color pattern of *R. h. hesperioides* as seen in specimen from south of Guachochic (BYU 22483).

Rhadinaea hesperia hesperioides Smith, 1942a, Proc. Biol. Soc. Washington 55:186.

Rhadinaea hesperia Myers, 1974, Bull. Amer. Mus. Nat. Hist. 153:81.

30 mi (by road) S Guachochic, 1 (BYU 22483).

This female specimen, taken in the Río San Miguel Valley in southwestern Chihuahua, is a new record for the state. Based on published records available, it is at least 250 miles north of the previous records at Plomosas and Santa Lucía in southern Sinaloa. The specimen was taken in the lower edge of the pine forest well above the lowlands along the Río San Miguel. Except that the ventrals (159) are more than any specimen thus far reported for Sinaloa (149–154), the scale counts are similar: 17-17-17 scale rows, 121 caudals, 8-8 supralabials, 10-10 infralabials, 1-1 preoculars and 1-1 presuboculars, 2-2 postoculars, 1-1 loreals and 1-2 temporals. The specimen is a subadult, 250 mm total length and, of this, 90 mm is tail (36% of total length). The high ventral count may be an indication of a south to north cline, a reversal of the north-south clinal trend from west central Mexico (Jalisco-Michoacán) into Guerrero and Oaxaca.

The color pattern is in variance to the description of Myers (1974) for specimens from southern Sinaloa (Fig. 4). At midbody the dorsolateral stripe is on rows 5-6-7, with only the edges of rows 5 and 7 involved, but with more of row 5 included than row 7. On each scale of row 5 below the light stripe is a series of dark spots involving most of the ventral part of the scale and forming, in contrast to the light

stripe, a broken dark line. There are no discernible dark stripes on rows 7 or 8. The dorsal area between the dorsolateral stripes is pigmented with brown and with dark flecking in the center of row 9, but without a distinct solid, dark stripe. A distinct, light line on the adjacent halves of rows 2 and 3 is clearly visible and is bordered both below and above by narrow, dark stripes. The area between this lateral stripe and the dorsolateral stripe is pigmented as the dorsal rows (8 and 9). The supralabials are edged above with dark stripe, but also with a series of irregular, dark spots near their ventral center, forming a broken line extending to the spots on the edge of the ventrals. The temporal stripe is distinct and extends only to the nasal scale. This stripe is two plus scales anterior from the dorsolateral stripe.

Although the color pattern differs from both *hesperia* and *hesperioides* as described by Myers (1974), it does conform closely to the latter as described by Smith (1942a). A series from southwestern Chihuahua and/or northern Sinaloa is needed before a final judgment can be made as to the final disposition of the subspecies *hesperioides*. Smith (1942a), in describing *hesperioides*, makes the following statement: "A light stripe, most distinct anteriorly, on adjacent halves of second and third scale rows." This, along with other characteristics, seemingly places not only this specimen in the subspecies *R. h. hesperioides* but also seems to justify the recognition of *hesperioides* as a valid taxon.

A review of the literature (Smith 1942a, Hardy and McDiarmid 1969, Myers 1974) indicated that I should at least examine some specimens from Sinaloa for comparisons before concluding this species report. The three KU specimens (75629, 80870–1) seen, figured, and discussed by Myers were examined. In both 80871 and 75629, the lateral, light line on rows 2-3 (noted by Smith in the type series of *hesperioides*) is clearly evident. Myers (1974, Fig. 11-L) illustrates the body color pattern of KU 80871 but represents it as not having a lateral, light stripe on rows 2-3. However, the stripe is present not only on KU 80871 but also on KU 75629, and it extends the length of the body. In the larger specimen (KU 80870) from 12.3 km (by Highway 40) SW of Santa Lucía, the lateral line is faint but discernible. The question arises as to whether there is a fading or blending of the lateral pattern in older individuals. In any event, the few specimens available from Sinaloa and Chihuahua suggest that the subspecies *R. h. hesperioides* should be recognized based on its distinct color pattern (Fig. 3).

Rhinocheilus lecontei tessellatus Garman

Rhinocheilus lecontei tessellatus Garman, 1883, Mem. Mus. Comp. Zool. 8(3):74.

Rhinocheilus lecontei tessellatus Medica, 1975, Cat. Amer. Amph. and Rept., p. 175. Type locality, Monclova, Coahuila; Klauber, 1941. San Diego Soc. Nat. Hist. 9(29):302–308; Smith and Taylor, 1945. Bull. U.S. Nat. Mus. 187:121.

6.7 mi NW Chihuahua City, 2 (BYU 15284 and 15318).
33 mi N Chihuahua City, 1 (BYU 15285).
37 mi N Chihuahua City, 1 (BYU 15286).
17 mi S Sueco, 1 (BYU 15343).
9 mi N El Sauz, 1 (UTEP 1309).
3 mi W Jiménez, 1 (UTEP 4096).
13 mi NW Jiménez, 1 (UTEP 4227).
18 mi S Villa Ahumada, 1 (UTEP 4545).
6 mi S Moctezuma, 1 (UTEP 4546).

The scale counts and color patterns were consistently within the range limits listed by Klauber (1941) for this subspecies. One specimen (BYU 15318), compared with Ridgeway color Plate I, was nearly equal to the color listed as Geranium Pink.

Unfortunately, most of the specimens were DOR. However, the distribution records do place this species within the central part of Chihuahua from south of Juarez City along Highway 45 to the Durango border. The greatest concentration seems to be between Villa Ahumada and Ciudad Chihuahua. Why, with our many trips from El Sueco to Casas Grandes, we did not see this species is not explainable; it is suspected to be present in most of the desert valleys between the western mountains and the eastern deserts.

Salvadora g. grahamiae Baird & Girard

Salvadora grahamiae Baird and Girard, 1853, Cat. N. Amer. Rept. pt. 1:104.

Salvadora g. grahamiae Bogert, 1939. Publ. Univ. California Los Angeles 1(10):186–189.

7 mi from Highway 10 up Tinaja Canyon, 1 (BYU 13850).
27 km SW Colonia Juarez, 1 (BYU 15462).
2.2 mi NE Hidalgo del Parral, 1 (UAZ 26183).
Los Leones, 18.4 km Yepomera, 1 (UAZ 34417).

Bogert (1939) lists four specimens from Chihuahua (possibly USNM 8225), Presidio del Norte (USNM 2080), Barranca del Cobre (R. T. Moore, No. 24), and Batopilas (USNM 46505). Smith (1943) lists the specimen from Batopilas (USNM 46505) as *S. h. deserticola.*

The two specimens from north central Chihuahua (BYU 13850 and 15462) have the same basic characters seen in specimens from New Mexico and Texas. Ventrals 186 in a male and 197 in one female; caudals 103 in male, female tail incomplete. The head of the female is badly mashed, but the male has the following head scales: supralabials 8-9 with the 2nd contacting the 1st section of the nasal on one side; 2nd supralabial in contact with loreals; loreals 1-1; preoculars 4-4; postoculars 2-2; temporals 1-3-2; infralabials 9-9; posterior chin shields shorter than anterior and divided by two small scales. Color pattern is as illustrated by Schmidt (1940:145).

The above data are a close approximation to the description of the type as reported by Schmidt. Both specimens were collected at about 1700-1800 m (5500-6000 ft), well above the desert valleys to the east, corresponding to the habitat reported for the species in the Huachuca Mountains of Arizona and the Chisos Mountains of western Texas. The habitat in Chihuahua (as we observed it) is in the scrub oak between the desert valleys and the longleaf pine habitats.

Bogert and Oliver (1945) identified the specimen from the Barranca del Cobre (RTM 24) as *S. bairdi.* Smith (1943) lists a specimen (USNM 46505) from Batopilas as *S. h. deserticola.* Hardy and McDiarmid (1969) list both species as occurring in Sinaloa, and it is thus possible that both occur in southwestern Chihuahua, where many species have ascended the river valleys from the coastal lowlands.

A comparison of the data presented by Schmidt (1940), Smith (1943), Bogert and Oliver (1945), Hardy and McDiarmid (1969) and the data available to me suggest that there is a close relationship between *bairdi* and *grahamiae.* There is little or no basic difference in the scalation between *grahamiae* and *bairdi.* An overlapping of scale patterns occurs or the patterns do not vary. The head and body proportions are the same and the rostral scale is the same in both. The only real variation occurs in the color patterns. Sinaloan specimens examined (BYU 37929, KU 68753) and those reported by Hardy and McDiarmid (1969) have a dark lateral stripe on the 3rd scale row. Specimens of *S. g. grahamiae* usually do not have this stripe but do have a dark spot at the base of each scale on the third row. These spots vary in size, with some individuals having small ones and others much enlarged ones forming a dotted stripe. This remnant may be the modified stripe so apparent in *bairdi.*

The two specimens from central and southern Chihuahua (UAZ 34417 and 26183) are similar in scalation but show variation in the color and color pattern. Specimens from Coyotes, Durango (UAS 28077 and 37737), have similar scalation to those from Chihuahua but vary in the color pattern. This variation ranges from a light, tannish brown to a darker brown lateral to the middorsal stripe. The lateral stripe may be present on row 3 or rows 3 and 4 as in UAZ 34417, 28077, and 37737, or it may be represented as a series of spots at the base of each scale on row 3 as in UAZ 26183 and BYU 13850 and 15462.

A specimen from Arroyo El Noghlito, west side of Sierra La Madera, 10 mi E Cumpas (UAZ 44947), and one from the west slope of San Luis Mts (UAZ 26182), Sonora, are also with distinct spots at the base of each scale but in these on row 4. These specimens extend the range of *grahamiae* into central and northeastern Sonora.

The distribution of *S. grahamiae* in Mexico is at least in the foothills of Chihuahua east of the mountains and extending south along the eastern escarpment to Zacatecas. Although specimens are not available from Northwest Chihuahua, the specimens from Sonora (east of Cumpas) suggest that the distribution includes those suitable habitats surrounding the Sierra Madre in northern Chihuahua and eastern Sonora.

With the geographical ranges coming ever closer in Sonora, and since there is little or no basic difference in scalation between *grahamiae* and *bairdi,* and since they share a similar color pattern, I am persuaded to include *bairdi* as a subspecies of *Salvadora grahamiae.* Thus, in Chihuahua there are the following: on the eastern foothills of the Sierra Madre and possibly extending at least around the northern end of these mountains into Sonora is *Salvadora grahamiae grahamiae*

Baird and Girard. On the western front of the Sierra Madre in southern Sonora, southwestern Chihuahua, and Sinaloa is *Salvadora grahamiae bairdi* (Jan).

Salvadora deserticola Schmidt

Salvadora hexalepis deserticola Schmidt, 1940, Publ. Field Mus. Nat. Hist. Zool. Ser. 24:146.

Salvadora deserticola Smith & Brodie, 1982, A Golden Field Guide, Western Publishing Co., p. 194.

2 mi N Colonia Juárez, 3 (BYU 13351, 15465 and 16109).
14 mi N Colonia Dublán, 1 (BYU 13978).
4 mi SE N Casas Grandes, 1 (BYU 13851).
6 mi NE Colonia Juárez, 1 (BYU 15372).
2 mi N Galeana, 1 (BYU 15357).
5 mi NW Galeana, 1 (BYU 15280).
23 mi E Buenaventura, 1 (BYU 15259).
6.7 mi N Chihuahua City, 2 (BYU 15287–8).
12 mi from Chihuahua (probably the City), 1 (MVZ 43656).
1 mi W Ojo Laguna, 1 (MVZ 73030).
20 mi SE Ciudad Camargo, 1 (MVZ 80001).
3 mi W Ciudad Camargo, 1 (UTEP 1318).
Río Santa María near Progreso, 6 (USNM 104668–73).
Near Balleza, 1 (USNM 46504).
Casas Grandes, 2 (USNM 46375–6).
Batopilas, 1 (USNM 46505 not seen).
Chihuahua, 2 (USNM 14255 and 14295).
Cd. Chihuahua, 1 (USNM 46451).
Lake Santa María, 1 (USNM 46594).

All of the specimens examined by me from Chihuahua were taken in the desert valleys between Highway 45 and the western mountains, except for those taken by Nelson and Goldman and reported by Goldman (1951: 118–9). All were taken in central Chihuahua except the Batopilas specimen and at elevations up to 1800 m (6,000 ft). This species does occur west of the mountains in Sonora and Sinaloa, and does also range into the lower valleys of southwestern Chihuahua.

Twenty-nine specimens from Chihuahua and the adjoining states of Sonora (2) and one each from New Mexico and Texas have the following scale counts: ventrals, males 179(186.3)202, females 183(189.6)204; caudals, males 76(80.0)103, females 68(71.0)74. Supralabials 9-9 in all (except one with 9-10), and infralabials usually 9-9 but also with 10 or 11 occasionally occurring on one or both sides. Preoculars usually 2-2 (1-1 in two, 1-2 and 2-3 in one), postoculars 2-2, and temporals 2-3 or 2-2. Scale rows are 17 at midbody and 13 before the vent. In the Chihuahua series, the infralabials are usually 10 on at least one side but with an occasional individual with 9-9 or 9-10.

The two specimens from the vicinity of Navojoa, Sonora, both have ventral counts that exceed 200 (202–204). None of the Chihuahua specimens exceed 197, and they average 189 (179–197). A larger series from the entire range may indicate the significance of these and other variations within this species.

Bogert and Oliver (1945:404) reported a specimen from Ahome, Sinaloa, with 205 ventrals. The two specimens listed above from Sonora (a male and female) indicate that the number of ventrals in northern Sinaloa and Sonora may average higher than in eastern Chihuahua.

Sonora semiannulata Baird and Girard

Sonora semiannulata Baird and Girard, 1853, Cat. N. Amer. Rept., p. 117.

Sonora semiannulata isozona Stickel, 1943, Proc. Biol. Soc. Washington 56:120.

Sonora semiannulata Frost, 1983, Cat. Amer. Amph. and Rept., p. 333.

6.5 mi N (by road) and 1.5 mi W of Chihuahua City, 14 (BYU 14203–6, 15289–91, 17001–7).
3.7 mi (by road) N Chihuahua City, 1 (BYU 15292).
11.5 mi SE Nueva Casas Grandes, 3 (BYU 13852, 14246, 17692).
Mezquite, approximately 17 mi SW Chihuahua City, 1 (KU 56228).

A series of 20 specimens is available from an area extending from Casas Grandes south to 25 km (16 mi) south of Chihuahua City. Within the populations that have been sampled, and particularly those 9 km (6 mi) northwest of Chihuahua City, all have the color variations previously reported for the subspecies *isozona* (Stickel 1943, Tanner and Jorgensen 1963). The plain grey, the normal bicolored, and the various modifications in between range from one specimen with bright, scarlet red (without dark bars) on the scale rows to those with red lines the length of the body and without any trace of black bands and those with a more uniform orange on the more dorsal scale rows and grey extending from the ventrals onto the first few rows of dorsals. The specimens seen from Idaho through Utah, southern Nevada, and Arizona have also exhibited this complete range of color patterns, and there is little variation that has not been encountered throughout the very broad range of the species *semiannulata*.

The major differences between the Chihuahua specimens and a large series from southern Utah and Nevada is to be found in the number of ventrals and occurrence of the standard bicolored pattern in the Utah population. The 9 males from Chihuahua show an average of 151.5 (148–154) ventrals and 53 (52–54) caudals whereas the Utah specimens average 164 (159–168) ventrals and 55.4 (50–61) caudals. The females in Chihuahua average 162 (160–168) and in the Utah series 175 (168–178), with caudals 47.8 (45–51) and 45.3 (42–49), respectively.

Although Stickel (1938) gave considerable general information concerning the subspecies of *Sonora semiannulata*, some of the details, particularly with reference to the subspecies *blanchardi*, are lacking. The available information suggests that the Chihuahua population may be more closely associated with Stickel's *blanchardi* than to either *s. semiannulata* or *s. isozona*. Tanner and Jorgensen (1963) discussed the many color patterns that occur in this species, and I have since concluded that pattern is not a useful character to be used in the identification of the subspecies of *semiannulata*. Apparently there is an increasing cline from southeast to northwest in the number of ventrals, all of which raises a question as to the justification for recognizing the several subspecies occurring between Chihuahua, western Texas, and the areas extending westward through New Mexico, Arizona, Utah, Nevada, and Idaho. The color patterns and scalation patterns seem to justify not recognizing subspecies at this time, as recommended by Frost (1983) also.

Storeria storerioides (Cope)

Tropidoclonion storerioides Cope, 1865, Proc. Acad. Nat. Sci. Philadelphia 17:190–191.
Storeria storerioides Garman, 1883, Mem. Mus. Comp. Zool. 8(3):29.
26 mi W San Juanito (by road), 1 (BYU 16955).

This specimen was taken 12 July 1960 from among rocks and litter under a rotten spruce log on the north side of a wet, rocky slope.

Anderson (1960) reported on two specimens he collected at Yaguirachic, a locality almost directly west of La Junta and approximately 128 km (80 mi) north of the specimen taken west of San Juanito. These specimens were taken in moist or wet habitats and in pine or fir forests.

A comparison of the scale patterns of the three Chihuahua specimens to those reported by Cope (1900), Taylor and Smith (1938), and Duellman (1961) do not indicate any important variations except that the ventrals seem to be fewer, perhaps representing the lower end of a north-south cline. The ventrals are 124–127, caudals 37–49 and the scale rows are 15-15-14. Other scale and color characters do not seemingly vary from data available from specimens taken in central Mexico and from those reported by Anderson (1960). Perhaps the most remarkable fact concerning these records is that they represent a northern extension of the range into central Chihuahua, a distance of more than 480 km (300 mi) from records in Durango and Sinaloa.

Sympholis lippiens rectilimbus Hensley

Sympholis lippiens rectilimbus Hensley, 1966, Herpetologica 22:48–55.
Urique, 3 (KU 56229–31).

The three specimens have scale and color patterns that are well within the limits set by Hensley (1966) except for the female (KU 56230), which has 17 caudals, and KU 56231, which has a light spot on the parietals rather than the cream-colored band covering the entire posterior area of the head. Hensley described the pattern but did not identify the specimen. This is another species that has entered Chihuahua from Sinaloa by way of the deep barrancas cut by tributaries of the Río Fuerte.

These three specimens, by the way, have an interesting history. Before leaving Urique in August 1958, we left with the Presidente a gallon jar containing 10% formalin and instructed him to put any small snake in it. We also left a few tags that were apparently lost. Dr. William E. Duellman has been so kind as to provide the field notes of Sydney Anderson, which are as follows: "Above specimens collected in August 1959 by Mexican in Urique who had jar of formalin given him by American last August." The date in Anderson's field catalog is 11 May 1960.

Because adequate material was not available to determine variation in certain characters, both scutellation and color patterns, Hardy and McDiarmid (1969) refrained from recognizing the subspecies *rectilimbus*. I have examined only five specimens—three

from Chihuahua (KU 45229–31), one from Sonora (11 mi WSW of Alamos, BYU 41197), and one from Sinaloa (11.6 mi S of Rio Piaxtla, DOR on Highway 15, BYU 23927). Although none of these were reported by Hardy and McDiarmid (1969) and three are paratypes of *S. l. rectilimbus* Hensley, a brief discussion seems warranted.

Three areas concerning this subspecies need further investigation: (a) there is a clinal increase in the ventrals and caudals from south to north, with the higher counts occurring in the north; (b) the dark bands may be as broad as 7–12 scales across and the light bands as narrow as 1 and 1/2–3 scales (according to previous published reports, the dark bands are narrower and the white bands up to 5 scales across); (c) the head and nape pattern is variable, showing at least three distinct arrangements of the white nape pattern. Two are described and figured by Hensley (1966), and in a third the usual wide, light nape band is restricted to a small spot completely surrounded by the dark of the frontal, temporal, and the first dark body band. One of the Chihuahua specimens and the one from Sonora have this pattern.

Considerably more specimens must be studied before one can determine which pattern or patterns represent the subspecies *S. l. rectilimbus*.

The material I have seen, though variable and with indications of subspeciation, does need a study of a much larger series than has been available thus far. Until such a study is made, I prefer to retain the subspecies *Sympholis lippiens rectilimbus* Hensley.

Tantilla nigriceps Kennicott

Tantilla nigriceps Kennicott, 1860, Proc. Acad. Nat. Sci. Philadelphia 12:328.

Tantilla nigriceps nigriceps Smith, 1938, Copeia (3):150. Foothills east edge of Colonia Juárez, 2 (BYU 14299 and 16105, both females).
Chihuahua City, 1 (BYU 14340) (badly damaged).

Only the scale counts for the Colonia Juárez specimens are available. The ventrals are 163 and 156, respectively, and the caudals in the latter are 47. In all three specimens the head cap is 3–5 scales posterior to the parietals and is angular shaped in one and pointed in two.

The specimen from Chihuahua City was given to me while at a motel in the northern part of the city. It had been killed and was partly eaten by ants. The only real characters for identification are the extension of the head cap at least four scales posterior to the parietals and the wide separation by the first pair of infralabials of the mental from the anterior pair of genials. Cole and Hardy (1981) list five specimens from Chihuahua along Highway 45 (S Samalayuca and Villa Ahumada) and west along Highway 10 into the Nuevo Casas Grandes area.

According to Cole and Hardy (1981), the geographic ranges of *T. nigriceps* and *T. hobartsmithi* broadly overlap in Chihuahua. I have not found this to be the case, nor are there actual distributional data in their report (1981 or 1983) to support such a conclusion. Their range map places *T. hobartsmithi* well to the east of any known locality records for *T. nigriceps* if we base their conclusions on the data presented. There may be an overlapping of ranges in this area, but as yet this has not been demonstrated.

In view of the wide range of *T. nigriceps*, it would be more convincing if additional data would have been presented to justify the extremely narrow extension of *T. hobartsmithi* into eastern Chihuahua. Based on the data they presented, females from that area could belong to either species. Reynolds and Scott (1977) list three specimens of *T. nigriceps* from along Highway 16.

Tantilla wilcoxi Stejneger

Tantilla wilcoxi Stejneger, 1902, Proc. U.S. Nat. Mus 25:156. Ft. Huachuca, Arizona.
Red Rock, 12 mi up Tinaja Canyon, 2 (BYU 13847–8).
50 mi W Chihuahua City (Highway 30), 1 (BYU 13849).
25 mi SE Creel (La Bufa Road), 1 (BYU 16863).

The following data apply to the specimens listed above. Males: ventrals 149–158, females 153–159. Only one male and one female had a complete tail, with 72 and 69 caudals, respectively. By including the data of four specimens reported by Taylor and Knobloch (1940), the following range for three males and five females is: ventrals 149(154)158 and 153(158.8)164. The caudals in two males are 62 and 72 and in three females 64, 67, and 69. Head scales are uniform and there are 15 dorsal rows in all specimens.

Color pattern in the four specimens listed above is uniform. The nape ring involves the tips of the parietals and one or two posterior scales.

Only a few specimens of *Tantilla wilcoxi* have been collected in Chihuahua. Taylor and Knobloch (1940) reported four specimens from the Sierra Madre Occidental, presumably taken in the vicinity of Majorachic. In a recent study by Cole and Hardy (1981), a single specimen is listed from the vicinity of Stacíon Barbara. During the years spent in Chihuahua, four additional specimens were collected (as listed above). The specimen taken south of Creel represents the most southern extent of the known range in Chihuahua. There is little variation in the scale or color patterns exhibited by the specimens taken over the rather wide range in Chihuahua. Those on each side of the Continental Divide show little variation in contrast to some of the other species listed in this report.

Since the above was written, the catalog account by Liner (1983) appeared; it does not include those records listed above from central and northern Chihuahua. Liner's distribution map and the new records in this report suggest that this species may occur in the mountains of central and western Chihuahua from the northern end of the Sierra Madre Occidental south through at least western Chihuahua to perhaps extreme eastern Sonora, Sinaloa, and into most of Durango. Our records indicate a habitat in Chihuahua above 1500 m (5000 ft) and in the area of the foothills on the eastern edge of the Sierra Madre above the desert valleys and extending into the forested areas above 2250 m (7500 ft).

Tantilla yaquia Smith

Tantilla yaquia Smith, 1942, Zoologica 27:41.

Only the type specimen (MCZ 43274, not examined) has been taken in Chihuahua (Guasaremos, Río Mayo). The foothills extending south and then perhaps eastward into the barrancas of the Río El Fuerte may also be included in its geographical distribution.

Thamnophis Fitzinger

Except for the crotalids, the garter snakes are represented in Chihuahua by more species than any other group of serpents. We collected six species with three additional subspecies, and the literature (Smith and Taylor 1945, Fitch 1965) cites a seventh. Since the report by Smith and Taylor (1945), a number of studies dealing with this genus have appeared (Bogert and Oliver 1945, Thompson 1957, Tanner 1959a, Conant 1963, Fitch 1965, Webb 1966, Hardy and McDiarmid 1969, Rossman 1971, and others).

In none of the studies listed above are all the species of *Thamnophis*, known to occur in Chihuahua, examined as a group and their distribution and variations considered.

Thamnophis rufipunctatus (Cope)

In recent years this species has been reviewed by several authors, each adding new data. However, the problems of generic designation and the possibility of subspecies within this widespread species warrants additional consideration. The reexamination of its generic position is again evaluated, based on additional material from most of the known areas of distribution. I have examined for this report 148 specimens and have reviewed data by others. Field notes, based on extensive work in Chihuahua and limited travels in Arizona and Durango, provide data on habits and habitats.

As data were evaluated, it became apparent that the species *T. rufipunctatus* has, for reasons of isolation and/or dispersal, developed significant character modifications that warrant the recognition of subspecies. This was most obvious when comparisons were made between *T. nigronuchalis* of Durango and the populations of *T. rufipunctatus* in Chihuahua, as well as the isolated population of the latter in Arizona and New Mexico. These comparisons aided materially in a better understanding of the relationships between the northern, isolated segment of the species and those populations occurring in Mexico. Although *Thamnophis rufipunctatus* is widely dispersed, it has maintained a surprising uniformity in most characters. The scale rows, number of loreals, preoculars, postoculars, labials, and, to a degree, ventrals and caudals, are rather uniform. Only in size and position of some scales is variation present. Color pattern also shows some variation and is with certain scale variations discussed below.

TABLE 2. Ventral and caudal variation in *Thamnophis rufipunctatus*.

Subspecies	No.	Sex	Ventrals	Caudals	Ventral-Caudals
Rufipunctatus	32	M	159(171.0)179	76(81.93)88	240(253.45)263
	25	F	156(164.68)171	67(70.21)79	232(239.1)243
Unilabialis	37	M	155(161.51)169	71(76.2)82	232(239.68)249
	27	F	151(156.68)163	65(69.95)76	219(226.43)239
Nigronuchalis	14	M	157(161.92)167	68(72.54)77	225(234.63)240
	15	F	152(156.53)160	62(66.57)72	215(223.25)230

A comparison of data for the Arizona–New Mexico, Chihuahua, and Durango populations indicates that three subspecies exist. In each case, these populations occur in widely separated drainage systems, with the Arizona and New Mexico specimens coming primarily from tributaries of the Salt River Basin extending along the southern edge of the Mogollon Rim and draining to the south and west. Between this population and that of Chihuahua lie the desert flats, extending from west of Phoenix east and south past Tucson and into southwestern New Mexico. The distance between these two populations is approximately 320 km (200 or more mi). The geographical differences between the Chihuahua *rufipunctatus* and Durango (*nigronuchalis*) populations are not as readily apparent, but they seemingly intergrade with each other somewhere in the highlands of northwestern Durango and/or southwestern Chihuahua.

Data now available clearly indicate that the Chihuahua and northeastern Durango populations represent a distinct group from either those in Arizona or west central Durango. Based on scalation (Table 2) and other characters, these subspecies are distinguished and described below.

Thamnophis rufipunctatus rufipunctatus (Cope)

Chilopoma rufipunctatum Cope, 1875, In Yarrow, Wheeler's Rept. Geog. Geol. Expl. Surv. W. 100th Mer. Zool. 5:544. Type locality, southern Arizona.

Eutaenia angustirostris Kennicott, 1860, Proc. Acad. Nat. Sci. Philadelphia 12:332. Type locality, Parras, Coahuila, Mexico.

Thamnophis angustirostris Ruthven, 1908, Bull. U.S. Nat. Mus. 61:120.

Atomarchus multimaculatus Cope, 1883, Amer. Nat., p. 1300. Type locality, San Francisco River, New Mexico.

Thamnophis rufipunctatus Smith, 1942c, Zoologica 27(3–4):120.

Natrix angustirostris Lowe, 1955, Copeia 1955(4): 307–309.

Thamnophis rufipunctatus Thompson, 1957. Occ. Pap. Mus. Zool. Univ. Michigan 584:1–10; Tanner, 1959a, Herpetologica 15(4):165; Conant, 1963, Copeia 3:480.

DIAGNOSIS.—A moderate- to large-sized subspecies usually with 21-21-17 scale rows, head elongate and compressed laterally; 1 loreal, 2 preoculars, usually 3 postoculars with the inferior one being narrowly separated from or barely contacting the 4th supralabial in 75% of the specimens; 2 or occasionally only 1 supralabial entering orbit; ventrals 156 to 179, caudals 67–88, ventral-caudals average 239 ♀, 254 ♂; (Table 2); ground color brown to olive brown, with 6 rows of dark brown or rust colored spots.

DISTRIBUTION.—Central Arizona east from Yavapai County into west central New Mexico.

SPECIMENS EXAMINED.—*Arizona:* UAZ 26543, 30944, 31384, 41344, Oak Creek Canyon; 26454–55, Big Bonito Creek at bridge to Maverick, Navajo Co.; 26456, Eagle Creek School, Greenlee Co.; 26457, East Fork of White River, 3 mi E Fort Apache, Navajo Co.; 26458, Point of Pines, Graham Co.; 26459, 15 mi SW Flagstaff, Coconino Co.; 26460, Black River at Diamond Fork, Greenlee Co.; 30951, Slide Park, Oak Creek Canyon, Coconino Co.; 30955, Oak Creek 1/2 mi up from Slide Rock; 31392, 31396 and 41343, East fork of Black River at Diamond Rock Camp, Apache Co.; 34157, 23 mi S Flagstaff; 37035 S of Sedona; 37824, Oak Creek 5–7 mi N Sonoma; 41342, 7 mi S Noury Ranch, Yavapai Co.; 41345–47, Kitbridge, Oak Creek Canyon; 41348–51, 18–20 mi S Flagstaff; 41352–55, 8–9.7 mi above Sedona; 44775, 2 mi by river below white crossing, Apache Co.; BYU 11465, Black Canyon, Yavapai Co.; ASU 10542, Gila Co.; NMMZ 8465, McNary fish cultural station; "17923, Black range at 10 of diamond ranch"; 13567–9, FAI,

reservation, Black River at old military crossing, Apache Co. *New Mexico:* NMMZ 387, Río San Francisco, 2 mi above Frisco Hot Springs; 385–6, Beaver Creek, Catron Co.; 7442, near Gila Cliff Dwellings Nat. Park, Grant Co.; 4582, Mogollon Mts. 2.5 mi W Wall Lake, Middle fork of Gila; 4616–7, 6023, E of Luna, Wall Dake; 6809, E of Luna, Glenwood Canyon; 10832, approx. 5 mi E Glenwood; 32017, Pleasanton E of Luna; 41625, West fork of Gila River 9 mi upstream from Gila Cliff Dwellings, Catron Co.

REMARKS.—In this subspecies, as in the Chihuahua form, only rarely does the midbody scale rows vary from 21. When variation occurs, an increase is to 22 or 23 rows (two specimens of each). In 53 specimens (106 counts), there are 2–5 postoculars with 80 having 3, 21 having 4, 4 with 2 and one with 5; those with only 2 postoculars have 2 supralabials widely contacting the orbit. In those with 3-3 postoculars, approximately 75% have a narrow contact of the 5th supralabial and the eye on one or both sides (Fig. 5A), or only reaching the 4th labial (Fig. 5B).

There is a distinct difference between *T. r. rufipunctatus* and specimens of the species from Chihuahua, the former having a greater number of both ventrals and caudals. There is only a slight overlap in ventral count and noteworthy differences when these scale counts are combined and averaged (Table 2).

In the subspecies *rufipunctatus*, the divided anal variation occurs primarily in populations of Oak Creek in Yavapai Co., Arizona, whereas this variation occurs in the Chihuahua and Durango subspecies only rarely. I am aware of only two specimens, AUZ 26465 from García, Chihuahua, and LSUMZ 16459 from 8.3 mi W El Salto, Durango.

Lowe (1955) placed *T. rufipunctatus* in the genus *Natrix*, based on the divided anal in some specimens of the Arizona population and on habits, color pattern, and its "water snake"–like habitude. Thompson (1957) reexamined the series seen by Lowe and included 14 additional specimens, in which 7 of the series had divided or partly divided anals (25% of the series). From these data he chose to retain *rufipunctatus* in the genus *Thamnophis*. Tanner (1959a) examined 52 specimens from Chihuahua and concurred with Thompson in retaining *rufipunctatus* in the genus *Thamnophis*. Conant (1963) also reviewed the previous studies, examined additional specimens from Chihuahua and Durango, and concurred in retaining *rufipunctatus* in the genus *Thamnophis*. Smith (1955) placed *Thamnophis multimaculatus* Cope, which was given species status by Taylor and Knobloch (1940), as a synonym of *T. rufipunctatus*. Thompson (1957) also reviewed the synonymy associated with *rufipunctatus* and, after examining four specimens from Parras, Coahuila, concluded that the type series of *T. angustirostris* Kennicott was in fact more closely related to *T. marcianus* than to Cope's *T. rufipunctatus*. He states that the name *angustirostris* was misapplied by Ruthven (1908) and should now belong in the synonymy of *T. marcianus*.

The placing of *rufipunctatus* in the genus *Natrix*, as suggested by Lowe (1955), is seemingly based primarily on the occurrence of a divided anal in some Arizona specimens. That anomaly has also been reported for *T. e. vagrans* (Tanner, 1950). The divided anal was

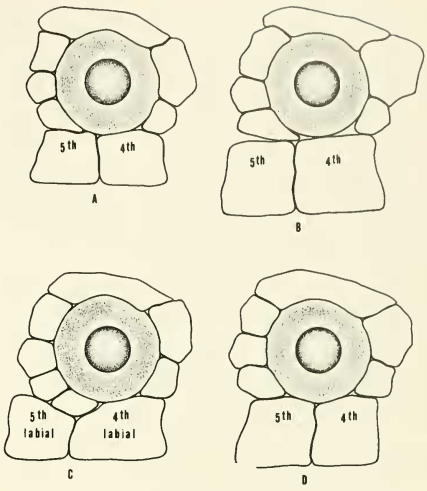

Fig. 5. The relationship of the supralabials and lower postoculars to the orbit in: A, (AUZ 31392); and B, (NMMZ 6023) relationship as seen in *Thamnophis r. rufipunctatus;* C, (BYU 14218) as seen in the Chihuahua–northeastern Durango populations (*Thamnophis r. unilabialis*); and D, (UTEP 3654 or LSUMZ 16450) as seen in *Thamnophis r. nigronuchalis* from west central Durango.

brought to my attention when students began classifying specimens of our local *Thamnophis* (Provo, Utah) in the genus *Natrix*. There is no question that *rufipunctatus* is an unusual species within the genus; with the elongate snout and narrow head, it appears to have become adapted for feeding on small, aquatic vertebrates—particularly fish and tadpoles. However, other species in the genus that are aquatic have not evolved the same head modification, indicating only that great flexibility exists within the genus *Thamnophis*.

Considering all of these factors, it would seem unjustifiable to place this species in a different genus based on a few anomalous specimens found in localized populations. I have seen 37 specimens from Arizona, and of these 5 have divided anals and 3 show a grooving. This is 21.6% with divided or grooved anals in contrast to a population in central Utah that reached 30%. A series of 25 specimens from eastern Arizona (Apache, Graham, Greenlee, and Navajo counties) and Grant and Catron counties in New Mexico do not have divided anals. Those with this character are generally confined to the local populations in Oak Creek and its tributaries in Yavapai and Gila counties of Arizona.

There may be other characteristics that relate *T. rufipunctatus* to the genus *Nerodia*. An in-depth study may reveal this relationship and justify a taxonomic adjustment as suggested by Lowe (1955). Such a study is beyond the scope of this report, even though it seems an important step. One character not included in previous studies is the structure of the hemipenis. Everted hemipenes of *T. rufipunctatus* are capitate. I note that the hemipenis of one of the spotted *Nerodia* (*harteri*), figured by Trapido (1941), is bilobate and appears from the figure to have a similar spine arrangement; that is, the enlarged spines on the proximal part of the structure occur in two series, with the sperm duct lying between them. Three specimens of *rufipunctatus* were examined (UTEP 3386, UAZ 34158, and LSUMZ 16451), and in each the organ is basically capitate and has two enlarged spines on the outer anterior edge and three on the posterior edge. It is a much different structure than that of *N. harteri*. A comparison of other *Thamnophis* (*elegans*, *cyrtopsis*, and *eques*) to *rufipunctatus*, and the figure for *N. harteri*, suggest a much closer overall structural relationship to *Thamnophis* than to the figure of *Nerodia harteri*. If, as indicated by Cole and Hardy (1981), the structure of the hemipenis is an important taxonomic character, then perhaps the generic status of *rufipunctatus* will not be satisfactorily resolved until an extensive comparative study is made for both *Thamnophis* and *Nerodia*.

Another character peculiar to *T. r. rufipunctatus* is the small, azygous scale separating the rostral from the internasals (Fig. 6). This scale appears randomly throughout most, if not the entire range and may be considered to be a unique character, particularly in the Arizona and some Chihuahua populations. The type of *T. multimaculatus* Cope (type locality San Francisco River, New Mexico) was stated to have this preinternasal scale, and it occurs randomly in specimens from Arizona, New Mexico, and Chihuahua. In the series from Arizona and New Mexico (53 specimens), 40% have the azygous preinternasal. In Chihuahua populations, only 24% of 67 specimens show this character, and the percentage is lower in Durango. Also, more specimens seen from Arizona have 10 infralabials (80.14%), as is also the case for most Chihuahua specimens. Excepted are those from San Pedro on the Papagochic and Bocoyna, which have 9 infralabials in 77.5% of the 20 specimens examined. This is in contrast to a series of 26 from Yepomera (about 80 km or 50 mi N and also on the Rio Papagochic), in which nearly 80% (43 of 52) have 10 infralabials.

The Chihuahua to northeastern Durango populations have both scale and color pattern variations that are different from those in Arizona and southwestern Durango, and compose a new subspecies described as follows.

Thamnophis rufipunctatus unilabialis, n. subsp.

HOLOTYPE.—BYU 14217, an adult female from .5 mi SW of Bocoyna, Chihuahua, Mexico. Collected 11 July 1958 by W. W. Tanner and W. G. Robison.

PARATYPES.—*Chihuahua*: BYU 14213–16, 14218, 14224, 17085–6, topotypes; 14368–14375 and 14485–6, San Pedro on Río Pa-

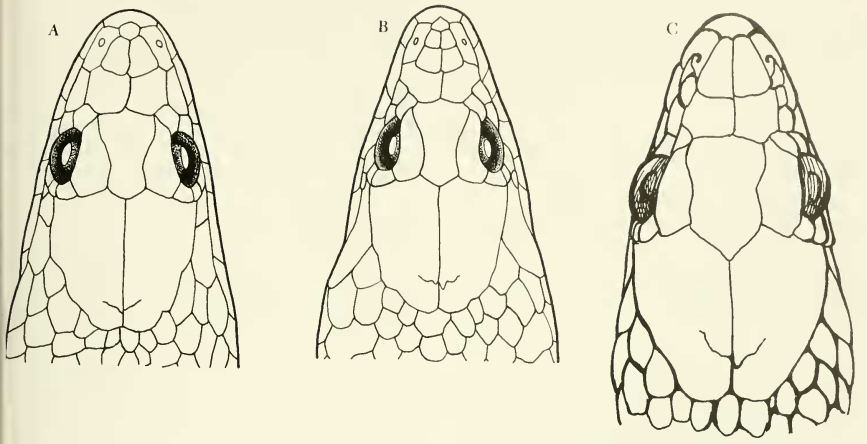

Fig. 6. Relationship of preinternasal scale to nasal and internasals: A, single azygous scale (BYU 14220); B, paired and azygous scales (BYU 13797); and C, usual pattern (BYU 14214).

pagochic; BYU 13797, 2 mi N Chuhuichupa; BYU 14219–20, Black Canyon, 8 mi W Chuhuichupa; BYU 14207, Río Bavispe, below Three Rivers; ASU 5304–6 and 5334–6, 3.8 mi SSE Galeana; ASU 17042, Río Tutuaca; AUZ 26461–2, 35922 and 36290, 4.5 mi SE Galeana; UAZ 34158–63, 34265–79, Yepómera; AUZ 35236, El Norte, 3 mi N Chuhuichupa; AUZ 26463–5, García; AMNH 73754–5, Noragachic; NMMZ 31256, Willys on Río Piedras Verdes; NMMZ 33463–5, ojo de Los Reyes; NMMZ 33478, 4.7 mi SE Galeana. *Sonora*: UAZ 35235, Yecora. *Durango*: UTEP 9078, 6 mi SW Los Frailes.

DIAGNOSIS.—A subspecies of *rufipunctatus* that differs from both *r. rufipunctatus* and *r. nigronuchalis* in having only the 4th supralabial contacting the eye by reason of the lower postocular having a firm contact with the 4th labial; ventrals reduced and ventral-caudal averages 13–15 scales fewer than in *r. rufipunctatus*. Ventral color pattern with anterior margins of scales usually pigmented, forming alternating dark and light transverse bands.

DESCRIPTION OF TYPE.—Head and body length 412 mm; tail at 96 mm, 21.8% of total length; head elongate and compressed laterally, dorsal head scales normal for the species; no azygous preinternasal scale, loreal single, preoculars 2-2, postoculars 3-3, temporals 1-3, scale rows 21-21-17, ventrals 156, caudals 67, anal single, lower postocular with a firm contact on 4th supralabial (Fig. 5C). A longitudinal series in six rows of light rust or dark brown spots (rust spots faded to light spots in preservative) on a dark grey ground color; ventrals and caudals with dark pigmentation on anterior margins, forming dark and light cross bars on ventrals; caudals with reduced pigment forming a dark speckling on a light grey gound color; dorsal head plates dark greyish brown, grading to lighter shades on labials; latter with dark stripes crossing upper third or half of each scale and forming a dark, posterior margin on all but the last 2 supralabials; lower labials with posterior margins edged in dark brown; gulars light grey and without spots.

VARIATION.—In this subspecies, there is little variation among scale and color pattern in the specimens examined. The 67 specimens seen show a small variation of only 8 to 14 scales difference in ventral plus caudal counts, with the greatest variation occurring in the ventrals of males. The one noticeable difference is in the presence of the preinternasal azygous scale, which is seemingly present in most, if not all individuals in the headwaters of the Río Bavispe. Five specimens from Chuhuichupa and its environs all have this

scale in several variations (Fig. 6), whereas few specimens on the east side of the Continental Divide and those in the Río Papagochic and Río El Fuerte drainage do not (3 of 45 specimens).

The most noticeable variation in the color pattern is the light, rust-colored spots in some specimens, whereas in others the spots are a dark brown; this difference persists in preserved specimens as faded light spots. Conant (1963), referring to the field notes of R. G. Zweifel, indicates that the live snakes at Miñaca had "reddish spots." The population at San Pedro also had individuals with bright spots, but we determined them to be a bright yellowish rust, quite in contrast to the red colors seen in kingsnakes or bicolored *Sonora*. That this color pattern was not observed in all specimens collected or seen may suggest an expression of a seasonal or sex-induced character.

In a few specimens, the two dorsal rows of spots anteriorly contact each other dorsally, giving the appearance of only 5 rows. The *rufipunctatus* in northern and eastern Durango, Chihuahua, and Arizona have a divided nuchal blotch. This is best seen in young or juvenile specimens in which the nape has a narrow (usually one or a fraction of a scale) light stripe extending from the parietals to divide the dark, irregular blotches. In older specimens, there is a fading or perhaps a blending of the nape color pattern, making it more difficult to identify the divided blotches, especially in preserved specimens. In the young, the spots on the body are dark and readily noted. Posterior to the nuchal blotches in the young is a series of 1–3 dark, middorsal spots. The spots posterior to this series usually divide, forming two rows of dorsolateral spots and thus leaving the normal number of six rows of spots at midbody. In most specimens, the anterior margins of the ventrals are heavily pigmented, but with the posterior much lighter. This produces an even or an irregular cross-barring pattern of dark and light pigment.

On the basis of other studies and our observations, it is obvious that this subspecies occurs throughout the Sierra Madre Occidental of central and western Chihuahua. It is found primarily along streams or in ponds or meadows where fish, tadpoles, and presumably other small, aquatic or semiaquatic vertebrates are foraged. At San Pedro (near Miñaca), we observed a subadult catch a small minnow. When we visited this locality (10 July 1958), the stream was low and clear and the small fish were abundant in the pools along the rocky stream bed. It was also evident that the snakes were feeding on the fish from the fish odor we encountered when the snakes were handled.

At a pond 8 km (5 mi) SW of Bocoyna, this species was feeding on tadpoles. The pond was formed between the road and railroad grades with rocks forming the walls around the pond. Along the water's edge, large numbers of snakes were seen; when disturbed, they descended into the rock pile or the water. When they were handled, the fish odor was not present.

The following information, noted as the series was examined, may be of interest. Specimen UAZ 26461 collected 7 December 1958 at Yepómera was heavily infested with Acanthocephala. Their spiny heads protruded from between the scales, presumably an attempt to escape the preservative solutions. Two males from Bocoyna (BYU 14213 and 17085) and one from San Pedro (BYU 14368), Chihuahua, had everted hemipenes. In each case there were three large spines on the base of the lateral surface and two on the posterior surface. Small spines, but descending in size, covered the organ from the large proximal spines to the enlarged capitate distal end. Specimen UAZ 26460 from Black River at Diamond Fork, Greenlee County, Arizona, did not differ in this character. Specimen UAZ 34335 from Yepómera, Chihuahua, was gravid, with 7 or 8 nearly mature young. It was taken 17 July 1971.

Thamnophis rufipunctatus nigronuchalis Thompson

Thamnophis nigronuchalis Thompson, 1957, Occ. Pap. Mus. Zool. Univ. Mich. 584:1–10.

DIAGNOSIS.—A subspecies of *rufipunctatus* with supralabials 4 and 5 having a wide contact with the eye and with a single, dark, median nuchal spot.

DISTRIBUTION.—Type locality San Luis, Durango. Specimens examined: UTEP 3386–7, 6 mi SW El Salto; UTEP 3653–4, 1.5

mi W San Luis; UAZ 37709, 17 mi N Coyotes; MVZ 59235, 33 mi ENE El Salto; LSUMZ 11637, 6 mi SW El Salto; LSUMZ 16488–16460, 8.3 mi W El Salto; LSUMZ 33100, 8 mi WSW El Salto; LSUMZ 40830–40834, 40849, 5.6 mi W El Salto; NMMZ 32511, 0.3 mi W El Salto, Durango.

Remarks.—The above series is unusual in having few variations. The scale rows were 21-21-17 in most, the only variation occurring at the neck, where 5 specimens had 23 and 3 had 22 rows; supralabials 8-8 in most, but with 9-9 or 9-8 in a few; infralabials usually 10-10 and a few with 9-9 or 9-10; loreals 1-1; preoculars 2-2, rarely 3; postoculars 3-3 in all specimens examined; temporals 1-2 or 1-3 in about equal numbers.

The color pattern consists of a single nape blotch usually wider than long, lying just posterior to the parietals. Posterior to the nape blotch is a series of smaller, middorsal spots that may separate toward midbody in two rows of dorsolateral spots; if this occurs, there are 6 rows of spots, otherwise only 5 rows. Thompson (1957) states that there are 5–10 rows of spots. With some fusions and others splitting, one may at one point across the body count more than 6 rows. An examination of the spots along the entire body indicates that the basic number of rows is 6, reduced to 5 when the two dorsal rows remain fused.

The range of this subspecies suggests that it is confined to the high altitude basins that flow from near the Continental Divide westward. Considerably more material must be obtained before its total range will be known and also whether it occurs only west of the Continental Divide and/or if it intergrades with *r. unilabialis* in drainage basins north and east of the Continental Divide in Durango.

Subspecies relationships and variation.—The recognition of three subspecies in *T. rufipunctatus* is based primarily on variation in color pattern, ventral-caudal scale counts, and the relationship of the 4th or 5th labials contacting the eye (Fig. 5). There is little variation in the color pattern except that, in *T. r. nigronuchalis*, a single, large, nuchal blotch is present, whereas the northern subspecies have a divided blotch, at least in the young. When the spotting is apparent, there are usually 5 or 6 rows of body spots, and the head is similarly patterned and colored in all three subspecies. In some specimens of each subspecies, there are bright, yellowish rust spots. In the subspecies *nigronuchalis*, the two most dorsal rows of spots are often fused at least anteriorly, thus reducing the number of rows to 5, whereas in the other subspecies, the usual number of rows is 6. The five-row pattern is apparently a continuation along the dorsum of the central nape spot pattern in contrast to the divided nape spot pattern in the northern subspecies. The spotting in all subspecies is more apparent in the young and subadults, with some adults having a faded and less apparent spotted appearance, especially in preserved specimens.

There is some variation in the ventral color pattern. In the Chihuahua subspecies, the anterior edges of the ventrals are usually margined with dark pigment forming dark cross bars. In *r. rufipunctatus*, the ventral pigmentation tends to form two rows of ventrolateral spots, with only small amounts of pigmentation midventrally and in areas between the spots that are not pigmented. At least the barring effect is not obvious as in *r. unilabialis*. In the series of *nigronuchalis* from 8.9 km (5.6 mi) W of El Salto, there is no discernible ventral pattern. On about the anterior third of the body the ventrals are only flecked, but posterior ventrals show more and larger spots. In this series of specimens there isn't a uniform spotting or bar pattern.

Variation in the ventrals and caudals is indicated in Table 2, and the variation in the labial-eye character is seen in Figure 5. In all specimens of *r. nigronuchalis* examined, there is a wide contact between the 4th and 5th supralabials and the eye, whereas in *r. rufipunctatus*, about 25% of the specimens have the lower postocular making contact with the 4th labial and thus excluding the 5th labial from narrowly contacting the orbit. However, in most specimens of the latter, there is usually not a firm or broad contact between the lower postocular and the 4th labial, leaving a small area of contact between the 5th labial and the eye or merely with the tip of the lower postocular touching the 4th labial. In both subspecies (*nigronuchalis* and *rufipunctatus*), there are usually 3 postoculars. Only in the subspecies *rufipunctatus* and *unilabialis* have I observed 4 postoculars (in *rufipunctatus*, 16 of 74 counts, 21.6%). An

increase in postoculars occurs in the Chihuahua subspecies (43 of 128 counts, 33.6%). However, it is not the number of postoculars that prevents the 5th labial from contacting the orbit, but the size of the postocular scales. In Chihuahua specimens, the lower postocular, whether it is the 3rd or 4th scale, extends around the eye to form a firm contact with the 4th labial, thus permitting only the 4th to enter the orbit (Fig. 5). In specimens with only 2 postoculars, there are always 2 supralabials (4 and 5) that enter the orbit. In the series from Arizona and Chihuahua, 7 specimens (of 101) had 2 postoculars on one or both sides.

There are, however, small populational segments that do not fit all characteristics of these subspecies. An example is seen in the divided anal scale in the Oak Creek population of *r. rufipunctatus*. In *r. unilabialis*, a population in and around Galeana, Chihuahua has some individuals with a ventral color pattern similar to individuals in New Mexico. Also, the few specimens seen south of the Río San Miguel near the Durango-Chihuahua border have a ventral-caudal count noticeably higher than the other Chihuahua specimens. In each case, these small populations are widely separated from the main populations.

Each of these allopatric subspecies occurs in a separate drainage basin. *T. r. rufipunctatus* is primarily in the Gila River Basin, occurring principally in the tributaries draining the Mogollon Rim and the headwaters in east central Arizona and adjoining New Mexico. The greatest departure is in Chihuahua and northeastern Durango, in which such basins as the Río Bavispe, Río Papagochic, and Río El Fuerte drain from the Continental Divide to the west and the Río Conchos and other mainly northern small streams drain to the east. There is little variation in the populations that inhabit these basins, seemingly because they occur in the headwaters where contact, across the open basins on each side of the Continental Divide, is possible. There is, however, wide separation between the populations in Arizona and Chihuahua. Specimens from the headwaters of the Río Bavispe resemble the northern subspecies in that a high percentage of specimens have the azygous preinternasal scale. Since the Bavispe flows north and is part of the drainage basin in southern Arizona north from Douglas, the high frequency of this scale character in northern Chihuahua may represent a recent past contact with populations northward in east central Arizona and adjoining western New Mexico.

The distribution of the subspecies *nigronuchalis* is as yet not well defined. Records available seem to place it primarily in the upper basin of the Río Presidio, draining to the west. Intergrading specimens are not available. Some character variation, such as in the azygous scale of *rufipunctatus* and *unilabialis*, were not observed in *nigronuchalis*.

Conant (1963) states that the azygous scale character is present in two specimens from the Río Nazas drainage; however, in these, there is seemingly an anomalous condition where corners of internasals are cut off to form an extra scale. The azygous scale as described above is not a fragment, but it represents a median scale fitted in between the rostral and the anterior ends of the two internasals. As far as is known, this character (Fig. 6) does not occur in any Durango population, including *T. r. nigronuchalis*.

A specimen (UAZ 37709) from 37 km (17 mi) N of Coyotes has all the characters of *nigronuchalis* except that the nuchal blotch is lobate, that is, divided anteriorly but with the lobes connected posteriorly. In some specimens of *unilabialis*, the nape spots are narrowly divided, with only a fraction of a scale between them showing a light color. Specimens throughout the entire distribution of the species show color pattern similarities except for the single nape blotch in *r. nigronuchalis* and the ventral bar character in *r. unilabialis*. Only in a few characters is the variation sufficient to permit a separation into subspecies. Data available suggest that subspeciation is recent, perhaps occurring after the last pluvial period when isolation between the northern (Arizona–New Mexico) and the southern (Chihuahua and Durango) segments of the species occurred (Fig. 7).

Key to the Subspecies

1. A large, single nuchal blotch and two supralabials (4 and 5) widely contacting orbit ..... *r. nigronuchalis*

Fig. 7. Distribution map indicating the approximate distribution of the subspecies of *Thamnophis rufipunctatus*: A, *T. r. rufipunctatus*; B, *Thamnophis r. unilabialis*; and C, *T. r. nigronuchalis*.

— Nuchal blotch divided, two supralabials may or may not contact the orbit 2

2(1). Lower postocular forming a firm contact with the 4th supralabial (Fig. 5C); ventral + caudal averages less than 240; ventrals with anterior margin pigmented to form a series of dark crossbars ..... *r. unilabialis*

— Lower postocular not forming a firm contact with the 4th supralabial, usually with one or both sides failing to contact the 4th supralabial; ventral + caudal averages more than 239; ventrals spotted but rarely with anterior margins evenly pigmented to form light and dark cross bands ..... *r. rufipunctatus*

Thamnophis melanogaster chihuahuaensis Tanner

Tropidonotus melanogaster Peters, 1864, Monatsb. Acad. Wiss. Berlin, pp. 389–390.

Thamnophis melanogaster melanogaster Smith, 1942 (part), Zoologica 27:116–120.

Thamnophis melanogaster chihuahuaensis Tanner, 1959a, Herpetologica 15:170–172.

Bavispe River below Three Rivers, Chihuahua-Sonora line (BYU 14197, type specimen; BYU 13451, 13505–6, 13493, 13496, 13371, 13373, 14198–14202, 14208–9, topotypes-paratypes).
Cuiteco (BYU 14293).
6 mi SE Maguarichic (BYU 16914).
Río Urique approx. 10 mi below La Bufa Bridge (BYU 22696, 22698).
Río San Miguel (BYU 38331–37).

Since the original description (Tanner 1959a), 10 specimens have been added to our series: 1 (BYU 16914), taken 6 mi SE of Maguarichic; 2 (BYU 22696 and 22698) from the Urique River approximately 10 mi below the La Bufa Road Bridge, and 7 from the junction of the Río Verde and Río Loera west to the junction of the Río San Miguel and the Río Urique. Nine are females, one the largest of the entire series at 862 mm, and one the smallest at 204 mm. The small one taken on 1 October 1963 is undoubtedly a newborn and exhibits on each side three rows of alternating spots that are separated by a dark brown dorsal area. In none is there a middorsal light stripe. The larger specimens are a uniform olive brown dorsally and light slate with no dark spots ventrally.

The scalation and color pattern are well within parameters listed for the type series. Conant (1963) discusses at length the subspecies *T. m. canescens* from Durango and Zacatecas. His material from the Río Nazas and the Río Florida in northern Durango indicates that *canescens* may occur in southeastern Chihuahua in the southern tributaries of the Río Conchos. All specimens of *T. m. chihuahuaensis* have been taken in the Bavispe and El Fuerte River basins, both of which drain to the west. If intergrading populations occur, it will seemingly be in the headwaters of the Nazas southwest of Hidalgo del Parral or west in the upper tributaries of the Río San Miguel.

This species is found along permanent streams or ponds, not very far from water. Its aquatic habits were first observed as we collected the type series below Three Rivers on the Bavispe River. The snakes would climb onto the lower branches of a willow that hung over the river; any disturbance and they would fall into the water. We succeeded in catching them by getting into the river near the overhanging willows, and, as the snakes came up for air, we could catch them. Fortunately, the river was riled from recent rains—an aid, since the snakes could not see us. The large specimen from the Río Urique had eaten a fish.

Thamnophis cyrtopsis cyrtopsis (Kennicott)

Eutaenia cyrtopsis Kennicott, 1860, Proc. Acad. Nat. Sci. Phila. 12:333. Type locality, Rinconada, Coahuila, Mexico.

Thamnophis cyrtopsis cyrtopsis Smith, 1951, Copeia 1951:140.

Thamnophis cyrtopsis cyrtopsis Webb, 1980, Cat. Amer. Amph. and Rept., p. 245. Bavispe River below Three Rivers and near the Sonora-Chihuahua line, 11 (BYU 13367, 13370, 13372, 13583, and 14471–77).
Black Canyon 8 mi W Chuhuichupa, 1 (BYU 14222).
4.5 mi NE Colonia Juárez, 2 (BYU 14509 and 15464).
30 mi NNW Colonia Juárez (Tinaja Canyon), 1 (BYU 13443).
Colonia Juárez, 1 (BYU 17696).
22 mi S Creel, 2 (BYU 16953–4).
25.5 mi S Creel, 4 (BYU 17687–90).
Cuiteco, 2 (BYU 14269 and 15666).
6 mi S Hidalgo del Parral, 1 (BYU 13925).
Maguarichic, 3 (BYU 16909–11).
4.5 mi SE Maguarichic, 1 (BYU 17073).
10 mi SE Nuevo Casas Grandes, 2 (BYU 15316 and 17111).
14 mi W San Francisco del Oro, 1 (BYU 15711).
Tejabán, on rim of Barranca del Cobre near air strip, 1 (BYU 32038).
Río San Miguel, 5 (BYU 38339–43).

Webb (1966) lists 22 specimens from Chihuahua, 12 from Durango, 5 from Sonora, and 4 from Zacatecas. The range from Zacatecas north through Durango and Chihuahua is primarily in the mountains, the foothills, and the high plains to the east of the mountains. Only in the north does its range reach the Gulf Coast in Sonora. In the north it ranges into New Mexico, Arizona, western Texas, southern Colorado, and the upper basin of the Colorado River in eastern Utah.

This species was reviewed by Webb (1966), who listed three subspecies distributed in the southwestern United States and Mexico. The subspecies *cyrtopsis* is found throughout Chihuahua, except for the deep canyons of the southwest and is one of, if not the most, widespread and common snakes. Although it is commonly found along streams and mesic areas, it does occur in rather remote desert areas where springs occur.

Scale counts are based on 38 Chihuahua specimens taken from most areas west of

Highway 45. Ventrals range from 164 to 185, with the males averaging 177.3 and the females 171.1. Caudals range from 73 to 105, with the males averaging 97.1 and the females 86.5. These averages are approximately four scales higher than those reported by Webb (1966). Some of this discrepancy may have resulted from the fact that most of our specimens were secured in the higher elevations, where it is noted that scale counts are higher. The dorsal rows are consistently 19-19-17, except for one specimen from 4.5 mi SE of Maguarichic, which has 21-21-19 rows. This specimen is otherwise quite average for other mountain specimens. There is little variation in the head scales, there being with few exceptions 1 loreal; 1 preocular; 3 postoculars, with 2 or 4 occurring occasionally; temporals 1-2 or 1-3; supralabials 8, rarely 7 or 9; infralabials usually 10 but with 9 out of 80 counts having 11.

The color pattern is variable and fits generally the description given by Webb (1966). The middorsal stripe may be on one row, or it may involve the para-vertebral rows to as much as one-half of each scale. Anteriorly this stripe reaches to the parietals or terminates 1 or 2 scales posteriorly. If it reaches the parietals, the dark nape spot is divided by it. A wide middorsal stripe may involve 3 or 4 rows just posterior to the nape spot. Nevertheless in those specimens with only 1 row involved, little or no increase in size occurs at any point from nape to tail. Specimens with the narrow middorsal stripe may be dark between the lateral and dorsal stripes, thus resembling the mountain forms of *Thamnophis eques*. In such specimens only the reduced scale rows (19) and the lateral stripe on rows 2 and 3 serve to distinguish them from *eques*. Specimens vary not only in the width of the dorsal stripe, but also in the amount of pigment between the dorsal and lateral stripes (Webb 1980). As noted above, this may result in some misidentifications. Whether this dark color pattern is genetically or altitudinally (environmentally) induced convergence in *eques virgatenuis* or *c. cyrtopsis* is an interesting yet unsolved speculation.

In those specimens with distinct wide stripes and lighter ground color, a distinct spotting occurs above as well as below the lateral stripe. This is particularly true for young and juvenile specimens. In all specimens the sutures of the supralabials are edged with pigment. The sutures of the infralabials may or may not be edged with pigment, but never to the same extent as with the supralabials.

Thamnophis cyrtopsis collaris (Jan)

Tropidonotus collaris Jan, 1863, Elenco Sist. Ofidi, p. 69.
Thamnophis cyrtopsis cyclides Smith, 1951, Copeia 1951(2):140.
Thamnophis cyrtopsis collaris Webb, 1966, Tulane Studies in Zoology 13(2):55–70.
12 mi above Pitahaye, 1 (BYU 22685).
30 mi below (S) Guaruchic, 1 (BYU 22684).
2 mi N Cerocouhui, 3 (BYU 14478, 14595, 15651).
10 mi down Urique River from La Bufa Road Bridge, 2 (BYU 22690 and 22699).
Piedras Verdes, (near mouth of Río San Miguel) 1 (BYU 22683).
Webb (1966) lists 5 specimens from Urique.

The most distinguishing character is the dark (nearly black) nape band, which is not divided by the middorsal stripe (Webb 1980). In specimens from Cerocouhui, the dorsal stripe indents the collar but is several scales from the parietals. There is an increase in the caudals 91(101.2)110, based on 5 male specimens. This is 4 more than is present in 10 male Chihuahua specimens of *cyrtopsis*. Otherwise, the scalation is similar.

Specimens taken on the high plateau areas, that is, out of the deep barrancas, are *cyrtopsis*. This suggests that *collaris* is generally confined to the low canyon habitats of southwestern Chihuahua.

Thamnophis marcianus marcianus (Baird and Girard)

Eutaenia marciana Baird and Girard, 1853, Cat. N. Amer. Reptiles, pp. 36–37.
Thamnophis marciana Ruthven, 1908, U.S. Nat. Mus. Bull. 61:849–852.
Thamnophis marcianus marcianus Rossman, 1971, Occ. Papers Mus. Zool. Louisiana State Univ. Bull. 41:11.
Colonia Juárez, 2 (BYU 15466–7).

Only two juvenile specimens were collected from Juárez Creek, a tributary of the Río Casas Grandes. Distribution of this species in Chihuahua is apparently restricted to the northeastern part of the state, and seemingly in the drainage of those streams flowing northward and at present terminating in the desert lakes (now playas) in northern Chi-

huahua. It is assumed that their occurrence in this area is an extension of their range southward from Texas and New Mexico.

The scalation and color pattern fit within the ranges established by Rossman (1971) for both male and female specimens. However, the ground color and spotting is identical to specimens seen from Brewster and Jim Hogg counties in Texas. The light, parietal spot edged in black is very prominent and is thus in contrast to a series from Charleston, Cochise County, Arizona, a further indication that the Chihuahua population is an extension of the Texas population during the last Pluvial Period. The mesic areas between the closed basins in northern Chihuahua and the Rio Grande basin has been ecologically divided since perhaps the late Pleistocene.

Thamnophis elegans errans Smith

Thamnophis ordinoides errans Smith, 1942c, Zoologica 27:112.

Thamnophis ordinoides Fitch, 1948 (part), Copeia 1948:121–126.

Thamnophis elegans errans Tanner, 1959a, Herpetologica 15:168.

Thamnophis elegans errans Webb, 1976, Nat. Hist. Mus. of Los Angeles County Bull. 284:1–13.

Bocoyna, 1 (BYU 15742).

Black Canyon, 8 mi W of Chuhuichupa, 1 (BYU 14225).

Colonia Chuhuichupa, 21 (BYU 13889–96. 13921–23, 14479–81, 14492–95, 14501, 14505, 15721, and 15776).

2 mi S Creel, 5 (BYU 14381, 14511, 15644, and 17076–7).

The series listed above was seen by Webb (1976). His review of this *elegans* subspecies cannot be added to at this time, except to note that Tanner (1959a) arrived at essentially the same conclusion, namely that *errans* was indeed a southern subspecies of the widespread species *Thamnophis elegans*.

Tanner (1959a) and Webb (1976, 1980) discussed the characteristics of the specimens available from northwestern Chihuahua, that is, areas north of the Río Papigochic. Specimens from this northern area show considerable overlap in characters with *T. elegans vagrans* in Arizona, New Mexico, and Utah. This is particularly evident in the dorsal scale rows, which may be 21-21-17 or 19-19-17 or a combination. South of the Río Papigochic the scale row formula is 19-19-17 and there is an increase in the caudals (Creel area 89.75 and Chuhuichupa area 82.66). A reexamination of the BYU *errans* specimens suggests a strong relationship to the *elegans vagrans* population in central and southern Arizona. Although no *T. elegans* are known from the intervening area, the terrain is favorable for contact through the Bavispe River and its tributaries extending from southern Arizona (near Douglas) south, by way of the Río Bavispe, into western Chihuahua (Chuhuichupa area). Fitch (1948) raised *errans* to a full species on the basis of the reduced scale rows (19) and the reduced infralabials (9-9). Both these scale patterns occur in many, if not most, populations of *vagrans*, and, since the ventral-caudal counts are essentially the same, there are no scale character differences sufficient for considering *errans* to be other than a disjunct subspecies of *elegans*.

In addition the color patterns are similar, but with the southern populations of *vagrans* (central Arizona) and *errans* having a more distinct dorsal stripe, usually involving three dorsal rows, and with little or no invasion of the middorsal row by dark spots. The stripe is thus more uniform and distinct and unlike the undulating stripe in *elegans vagrans* from central Utah.

Fitch (1980) considered again the status of *Thamnophis elegans errans*. I would add only two additional comments. First, the species *Thamnophis elegans* is widely dispersed and as such has developed clinal variations because of its wide dispersion and isolation in some of the desert basins. The color pattern of the populations in the upper Colorado River basin of southeastern Utah is clearly distinct from those seen in the Little Colorado basin of Arizona. Specimens from Joseph City and near Holbrook, Arizona, have a wide dorsal stripe in which three rows of scales are involved; no dark spots invade it—or at least they do not disrupt the stripe as they do in the upper basin specimens. The color patterns in *errans* is thus similar to the Arizona *T. e. vagrans*. Fitch (1983) did not include *errans* in his report and distribution map of *Thamnophis elegans*, choosing to include only those populations north of Mexico.

A perusal of my field notes indicates that *errans* has essentially the same wandering habits as does *vagrans*. We found them along streams or ponds, in meadows, and in fields

during the rainy season. The distribution of *Thamnophis elegans* in southeastern Utah, Arizona, and Chihuahua is somewhat similar to that of *Lampropeltis pyromelana*, that is, in disjunct populations. *Thamnophis elegans* occurs in separate basins with wide desert areas separating them. In Chihuahua the extent of the deserts, particularly between those in Arizona and Chihuahua, has required the populations either to inhabit streamside habitats or to move into cooler, moist, mountain areas where habitat restrictions are not as severe.

The wide desert areas between *errans* and *vagrans* suggest again that, in the recent geological past, more favorable climatic conditions existed, permitting *T. elegans* to be widely dispersed over areas now desert and uninhabitable. However, as a consequence of this former distribution, those populations in northern Chihuahua would be expected to show remnants of intergrading or intermediate characteristics with those in Arizona not only in scalation, but also in color pattern. These factors suggest that the contact between them has been in the recent past. As indicated above, the population of *errans* south of the Río Papigochic has apparently been sufficiently isolated to have developed the basic characteristics of the subspecies. Nevertheless, on the basis of the material available to me, the type series (Smith 1942c) and the report by Webb (1976), it now appears that the more typical *errans* are found on the east side of the Continental Divide in northern Chihuahua (Garcia area) and south of the Papigochic River in southwestern Chihuahua and Durango, with the population in the headwaters of the Bavispe River (Chuhuichupa area) showing intergrading characteristics with the *elegans vagrans* to the north.

In 1957 and 1958 collecting was done during July (7-20), and each year the large females were gravid. Two (BYU 14493 and 15721) from Chuchuichupa had 6 and 7 nearly mature embryos, and two (BYU 17076 and 17077) from Creel had 10 and 8 embryos. The latter two specimens were 590 and 498 mm in total length. The largest specimen in the series is a female, 635 mm in total length.

Thamnophis eques megalops (Kennicott)

Eutaenia megalops Kennicott, 1860, Proc. Acad. Sci. Phila. 12:330–331.

Thamnophis macrostemma megalops Smith, 1939, Publ. Field Mus. Nat. Hist., Zool. Ser. 24:30–31.

Thamnophis eques megalops Smith, 1951, Copeia 1951:139–140. Conant, 1963, Copeia 1963:487.

Basiguare, 1 (BYU 22701).
Black Canyon, 8 mi W of Chuhuichupa, 6 (BYU 14221, 14223, 15744–46 and 15769).
Colonia Dublán, 1 (BYU 13731).
Colonia Juárez, 2 (BYU 243 and 1134).
5 mi S Gomez Farias, 1 (BYU 15747).
Guachochic at spring, 1 (BYU 22687).
10 mi S of Hidalgo del Parral, 1 (BYU 13924).
2 mi N Casas Grandes, 2 (BYU 14136–37).
4.5 mi S of Palomas, 1 (BYU 14504).
2 mi SE La Junta, 1 (BYU 17084).
San Pedro on Río Papigochic, 2 (BYU 14376 and 14487).

Conant (1963) listed 10 additional specimens from the areas west and south of Hidalgo del Parral, and the following are at the University of Texas at El Paso: El Sauz, Río Sauz, UTEP 3648; Ricardo Flores Magón, 3659–60; and Yepómera, 2053.

I have examined only the specimens available to me at BYU. These (19) vary little in scalation from that of Conant (1963:488) and are as follows: ventrals males 166(168.7)170; females 160(164.4)171; caudals males 83(84.8)87; females 69(73.5)78. Scalation of the head is similar in all details to that indicated by Conant for both subspecies *megalops* and *virgatenuis*.

I have not undertaken a systematic review of this species covering its entire area of distribution, although such a study is clearly warranted as suggested by Conant (1963:488). The color pattern varies on an altitudinal cline, with the wide, middorsal stripe occurring at low altitudes, that is, the low valleys and foothills primarily to the east of the western mountains. The narrow, one-scale-wide, middorsal stripe occurs only in populations at the higher elevations.

There is, based on the above series, a gradual reduction in the width of the dorsal stripe from those specimens from low elevations (formula 1/2-1-1/2) to the point that some specimens in the highlands (Bocoyna and Chuhuichupa) have an invasion of pigment into the middorsal scale row, reducing the stripe to a fraction of the row (−1−) (Conant's formula, 1963:490). If we consider any pigment encroachment into the paravertebral part of the middorsal stripe as an indication of intergradation between the subspecies, then a wide area in Chihuahua would lie in the zone

of intergradation. We find "true" *megalops* only in the lower valleys and *virgatenuis* only in the highest elevations.

There are two color pattern variables: first the size of the middorsal stripe depends on the degree of involvement of the paravertebral rows in the dorsal stripe, and second the melanistic pigment gradually increases to produce a nearly uniform dark pattern between the ventrolateral stripes and the middorsal stripe. All the variations figured by Conant (1963) are present in the Chihuahua specimens, but the above color pattern phenomenon is most noticeable in those specimens from the area of 6000 feet and higher. A few specimens from Black Canyon just west of Chuhuichupa and at about the same elevation range from little involvement of the paravertebral rows to a full one-half scale row involvement. There is little variation in color pattern between the Black Canyon and Chuhuichupa specimens, perhaps a little less involvement of the paravertebral rows in the latter. However, Conant (1963) considered the Chuhuichupa specimens to belong to the subspecies *virgatenuis* even though the formula for this population would be +1+ in all specimens. In both populations the area between the dorsal stripe and the lateral stripes is also nearly black, with only fine, light flecks. Apparently the only useful key characters to differentiate *virgatenuis* from *megalops* are for the dorsal stripe to occur only on the middorsal row and for the color between the lateral and dorsal stripe to be black or nearly so, with fine, white flecks showing between the scales.

Thamnophis eques virgatenuis Conant

Thamnophis eques virgatenuis Conant, 1963, Copeia 1963:490.
Bocoyna, 12 (BYU 14377–9, 15735–41, 17087–90).
4 mi S Bocoyna, 6 (BYU 17091–95, 14380).
1 mi S Chuhuichupa, 2 (BYU 13919–20).
Chuhuichupa, 7 (BYU 13896–97, 14482, 14497–500).
2 mi SE Creel, 5 (BYU 15641–43, 17074–75).
16 mi NE San Juanito, 2 (BYU 17028–29).
San Juanito, 1 (BYU 32039).
Colonia García, 1 (BYU 246).
5 mi WSW Colonia García, 1 (UTEP 4850).

Conant (1963) also lists 1 from Bocoyna (AMNH 74465) and 2 from Sisoguichi (AMNH 57389–90).

Although there is considerable intergradation in the color and color patterns of the populations of *Thamnophis eques* in Chihuahua and little variation in their scalation and body proportions, it is seemingly wise at this time to let the subspecies *T. e. virgatenuis* stand pending a detailed study of the species. The color pattern changes in the Chihuahua populations are gradual, with specimens taken between 6000 and 8000 feet showing the variants one might consider to represent the area as well as the range of intergradation. In a few specimens from Bocoyna, there is an invasion of the middorsal stripe by pigment to the point of reducing the stripe to only a fraction of a scale row. In this character, the evolutionary process may thus be moving to eliminate the middorsal stripe. At least the effect of the color pattern changes is toward a sustained though gradual reduction of the size of the middorsal stripe.

Specimens with the *virgatenuis* color pattern were not found south of Creel in the Barranca del Cobre and adjoining areas. It now appears that the population in the Bocoyna area is not only separated from the highland populations in Durango, but it is also separated from the Chuhuichupa population by the low areas in the basin of the Rio Papigochic. Thus, in Chihuahua, we now recognize two highland islands of the subspecies *T. eques virgatenuis*, both of which are surrounded by the subspecies *T. eques megalops* in the lower mountains, foothills, and valleys of western and southwestern Chihuahua, and with intergrading population in between.

The highlands of southern Chihuahua and northern Durango are not well known and may hold the answers to many distribution patterns not only for the several species of *Thamnophis*, but also for other species.

Thamnophis sirtalis dorsalis Baird & Girard

Eutaenia dorsalis Baird and Girard, 1853, Cat. N. Amer. Reptiles, p. 31.

Eutaenia ornata Baird, 1859, Rep. U.S. and Mex. Boundary Surv. 2:1–35.

Thamnophis sirtalis ornata Fitch and Maslin, 1961, Univ. Kansas Publ. Nat. Hist. 13(5):297–299.

Thamnophis sirtalis dorsalis Fitch, 1980, Cat. Amer. Amph. and Rept., p. 270.
6.2 km SE Galeana, Ojo de los Reyes 2 (UAZ 32780 and 36291).
0.8 km N Nuevas Casas Grandes 1 (UAZ 34434).
Yepomera vicinity 13, (UAZ 34066–71, 34149, 34230, 34399, 34879–82).

The specimen taken at Casas Grandes by Nelson and Goldman (USNM 46371) was reported by Smith (1942c), and a brief description was included. It is a female with the following scale counts: 19-19-17 scale rows, 152 ventrals, tail incomplete, 7-7 supralabials, 10-11 infralabials, 1-1 preoculars, and 3-3 postoculars. A specimen from New Mexico (E. D. Flaherty, no. 560, 1 mi W and 1/2 mi S of Isleta, Bernalillo County) reported by Fitch and Maslin (1961) is stated as having only 8-8 infralabials. This seems most unusual for any specimen of *sirtalis*. Of 114 counts (57 specimens) of *s. sirtalis* and *s. parietalis* (from Utah and Kansas), only one had a count of 8-9; all others were 9, 10, or 11, with 10 being the predominant count. Based on the characteristics of the few specimens previously reported, the normal lepidosis for this subspecies remains obscure or wanting for additional data.

An examination of the scalation and color patterns of the series reported by Van Devender and Lowe (1977) suggests that the population in the two northern valleys (Río Casas Grande and Rio Santa María) corresponds closely to those specimens previously reported by Smith (1942c) and Fitch and Maslin (1961). There are still two few specimens to establish basic data for this southern population. The two specimens from near Galeana (UAZ 32780 and 36291) have fewer ventrals than the other specimens (from N Casas Grande and Yepómera) and are similar in scalation (ventrals 151 and 152, labials 7-7 and 10-10) to the one reported by Smith (1942c) from Casas Grandes. Since Nelson and Goldman collected extensively north and east of Casas Grande but returned to that city or San Diego, where they reorganized for further trips, it is possible that the specimen (USUM 46371) was taken in the drainage of the Río Santa María. It has the basic characteristics of those seen from near Galeana. The single specimen from N Casas Grandes is a male with 166 ventrals and 84 caudals. These characters relate it to the Yepómera population and justify the suggestion of Van Devender and Lowe (1977) that the Yepómera population came into its present habitat by way of the Río Casas Grande.

The Yepómera population has developed a few characters not seen in most other populations of *sirtalis*. These will be discussed in a forthcoming study.

The occurrence of *sirtalis* in the valleys of northern Chihuahua is not surprising and is, undoubtedly, a relict population isolated after the desiccation following the last ice age severed the former water courses directly connected with the Río Grande. This is yet another example of the effects of the desiccation that occurred as the Pluvial Lakes such as Palomas disappeared and rendered the lowlands uninhabitable. We can now assign such species as *Lampropeltis pyromelana*, *Opheodreys vernalis*, *Thamnophis elegans*, and now *Thamnophis sirtalis* as relict populations.

Genus *Trimorphodon*

There are two species that occur in Chihuahua, with only one specimen of *b. vilkinsoni* and one of *b. lambda* having been collected; their distribution in the state is poorly documented. The secretive and nocturnal habits may account for the scarcity of collected specimens. *Trimorphodon tau* occurs in southwestern Chihuahua, inhabiting the deep canyons of the barrancas.

Trimorphodon biscutatus vilkinsoni Cope

Trimorphodon vilkinsoni Cope, 1886, Proc. Amer. Philos. 23:285–286; Taylor, 1939, Univ. Kansas Sci. Bull. 25:361–363; Smith, 1941b, Proc. U.S. Nat. Mus. 91:151–167.

Trimorphodon biscutatus vilkinsoni Gehlbach, 1971, Herpetologica 27:209.

Trimorphodon biscutatus vilkinsoni Scott and McDiarmid, 1984a, Cat. Amer. Amph. and Rept. 353:1–4.

Ciudad Chihuahua, 1 (USNM 14268, type specimen).

A description of the type is in the report by Taylor (1939b), and Smith ((1941b) provides a diagram of the possible phylogeny of the genus. The above reports dealt with only one or two specimens. Klauber (1940b) reported on three, Reynolds and Scott (1977) list three taken on Chihuahua Highway 16 between Villa Aldama and El Pastor, and Banicki and Webb (1982) have described in detail a series of 22 specimens from the Franklin Mountains in El Paso, Texas. However, the scarcity of specimens for Chihuahua still exists. Our many trips into Chihuahua produced no specimens, but we do have one additional female specimen from Green Gulch, Chisos Moun-

tains, Brewster County, Texas. It has the following scalation: scale rows 21-23-17, ventrals 231, caudals 74, supralabials 9-9, infralabials 12-13, loreals 2-2, preoculars 3-3, postoculars 2-3, and temporals 2-2-3 and 3-3-4. There are 24 body spots and 9 on the tail. These patterns correspond closely to those reported by Klauber (1940b) and Banicki and Webb (1982), but they do indicate that additional specimens from central Chihuahua may provide more variation than that seen in the specimens now available.

Trimorphodon biscutatus lambda Cope

Trimorphodon lambda Cope, 1886, Proc. Amer. Philos. 23:285–286.
Trimorphodon biscutatus lambda Gehlbach, 1971, Herpetologica 27(2):208.
Maguarachic, 1 (UMMZ 118926).

This female specimen has an unusually high ventral count for this subspecies. Other scale counts and the color pattern are, however, well within the limits of the subspecies. The scale counts are as follows: ventrals 255, caudals 67, anal divided, dorsal scale rows 19-23-16, supralabials 9-9, infralabials 12-12, preoculars 3-3, loreals 3-3, postoculars 3-4, and temporals 3-4. There are 26 dorsal body spots and 12 on the tail. At or near midbody the dorsal spots involve 12–15 rows of scales, with a dark spot extending from the lateral point of the spot to the first row above the ventrals.

REMARKS.—Using only the specimens available to me in the Monte L. Bean Life Science Museum (BYU), I find the series from Utah, Nevada, Arizona, and Sonora (16 specimens) to have a ventral range of 218-(221)-226 in males 227-(232.57)-246 in females. By adding the ventrals and caudals, the eight southern Arizona and Sonoran specimens and the Chihuahua specimen average 320 and range from 303 to 322, but the more northern specimens range from 292 to 301. This emphasizes the clinal decrease in these counts from south to north. All the specimens listed under *T. biscutata* have the chevron head pattern and a similar body pattern.

Hardy and McDiarmid (1969) list *Trimorphodon lambda paucimaculata* as occurring in northern Sinaloa. An examination of our series of *Trimorphodon* from Sonora (12) and Sinaloa (2), and 10 specimens from Arizona, Nevada, and Utah, suggests that only two species of *Trimorphodon* occur in Sonora and perhaps also in Sinaloa, *T. biscutatus* and *T. tau*. Two male specimens from southern Sinaloa (6.7 mi N Río Quelite) are *T. b. biscutatus* and have low ventral counts (192–197), suggesting a reversed cline from south to north. It is also suspected that any specimen previously identified as *lambda* or perhaps *paucimaculata* actually belongs to either the species *T. biscutatus* or *T. tau* (see Scott and McDiarmid 1984b:353, 1984:354).

Trimorphodon tau tau Cope

Trimorphodon tau Cope, 1869 (1870), Proc. Amer. Phil. Soc. 11:152.
Trimorphodon tau McDiarmid & Scott, 1970, Contributions in Sci., Los Angeles County Museum, no. 179:29.
Trimorphodon tau tau Scott & McDiarmid, 1984b, Cat. Amer. Amph. and Rept. 354:1–2.
Batopilas, 1 (USNM).

Only a single specimen is listed for Chihuahua. The species was collected by Edward Wilkinson and reported by Cope (1900:1105). The reports by McDiarmid and Scott (1970, 1984b) cite the locality on their range maps.

The occurrence of *T. tau* in Chihuahua is to be expected, since a number of specimens have been taken in northeastern Sinaloa only a few miles from Chihuahua. Additional collecting in the low valleys of southwestern Chihuahua will undoubtedly provide additional material.

Since this report was written, the catalog reports by Scott and McDiarmid (1984b) confirm the distribution of the above species in southwestern Chihuahua, Sinaloa, and Sonora.

Family Elapidae

On the basis of published reports (Cope 1900:1126, Bogert and Oliver 1945:407, Smith and Taylor 1945:169, Hardy and McDiarmid 1969:211, Zweifel and Norris 1955:245–8), there are seemingly only three records of elapids for Chihuahua. Both genera (*Micruroides* and *Micrurus*) occur in the southwestern part of the state, with their ranges extending westward into Sinaloa and Sonora.

Micruroides euryxanthus australis
Zweifel & Norris

Elaps euryxanthus Kennicott, 1860, Proc. Acad. Nat. Sci. Philadelphia, p. 336.
Micruroides euryxanthus australis Zweifel and Norris, 1955, Amer. Midl. Nat. 54:245–248.
Batopilas, 1 (USNM 8850 - Wm. Grant, collector).

Cope's record from Batopilas is referred to the subspecies *e. australis* by Zweifel and Norris (1955) and Roze (1974). This designation is most logical because of the nearness of Batopilas to the type locality (Guirocoba, Sonora), and because both are in the drainage of the Río El Fuerte.

The record (USNM 8566) from the northwest corner of Chihuahua is recorded as *M. e. euryxanthus* by Zweifel and Norris (1955:246) and Roze (1974:163). The subspecies referred to above undoubtedly have a wider distribution in western and northwestern Chihuahua. They are poorly represented in collections primarily because little collecting has been done in the fringe areas of their distribution.

Micrurus distans distans (Kennicott)

Elaps distans Kennicott, 1860, Proc. Acad. Nat. Sci. Philadelphia, 12:338.
Micrurus diastema distans Schmidt, 1933, Publ. Field Mus. Nat. Hist., Zool. Ser. 20:39.
Batosegachic (= Batosegachie of Smith and Taylor 1945), 1 (USNM 1144).

This locality is in southwestern Chihuahua, west of Cuiteco and approximately half the distance from Cuiteco to the Sonoran line. It is in the drainage of the Río Oteros, a northern tributary of the Río El Fuerte. Roze (1983) gives the distribution as southwestern Chihuahua and southern Sonora to Sinaloa and northwestern Nayarit, intergrading with the subspecies *zweifeli* in central Nayarit, Mexico.

The few records now available for the two genera of coral snakes indicate that they have overlapping ranges in southwestern Chihuahua and the adjoining terrain in eastern Sonora and northeastern Sinaloa.

Family Crotalidae

Seven species of this family are known to occur in Chihuahua. Four species or their subspecies occur in the lower valleys and foothills of central Chihuahua, with four species or their subspecies more commonly found in the western mountains. The single published record for *C. v. viridis* is for a specimen taken in the 1850s and is apparently valid. A second specimen, CAS-SU 14361 collected by Figg-Hoblyn et al. on 24 August 1950, 25 km (16 mi) E Chihuahua-Sonora border on the road between the towns of Bavispe (Sonora) and Nuevo Casas Grandes, is a confirmation of the distribution of *Crotalus v. viridis* occurring in northwestern Chihuahua. It is actually a slight extension southward of the range indicated by Klauber (1936). Intensive collecting in northern Chihuahua and Sonora may extend the range of *viridis* farther south and west.

If additional species of this family are in Chihuahua, the most likely area would be in river valleys extending into the mountains of southwestern Chihuahua. Other species may occur in the low valleys of the Urique, El Fuerte, and Oteros rivers that are not found elsewhere and represent species ascending these valleys from the coastal plains. We might expect that *C. basiliscus* will be found in one or all of these valleys.

In summary, there are seven rattlesnake species in the state of Chihuahua, and of these four are more commonly found in the mountains; that is, *willardi*, *pricei*, *lepidus*, and *molossus*. Of these, *lepidus* and *molossus* (Price 1982) do reach the desert foothills east of the mountains, but *atrox* and *scutulatus* are seemingly restricted to the deserts east and north of the mountains.

Crotalus molossus molossus Baird & Girard

Crotalus molossus Baird & Girard, 1853, Cat. N. Amer. Rept., p. 10.
Crotalus molossus molossus Gloyd, 1936a, Occ. Papers, Mus. Zool. Univ. Michigan 325:2.
23 km SW Colonia Juárez (on road to Chuhuichupa), 2 (BYU 13875–6).
3 mi N Chuhuichupa, 5 (BYU 13873–4 and 15382–4).
3 mi E Colonia García, 2 (BYU 15380–1).
11.3 mi W R. F. Magón, 1 (BYU 15251).
11 mi S Creel (on La Bufa Road), 1 (BYU 15399).
Head of Arroyo Guachochic (southwestern Chihuahua), 1 (BYU 22688).

Gloyd (1940) lists the following localities: Colonia García, District of Guerrero, Pacheco, and San Blas Mountains.

The series available to me does not suggest that, contrary to the distribution maps of Price (1980), *C. m. nigrescens* occurs in Chihuahua.

There is no doubt that the color (dark brown to black on tail and posterior one-fourth to one-third of body) indicates a modification of the color pattern in contrast to most specimens seen from Arizona and New Mexico. However, the scalation of the Chihuahua series does not fit that of *m. nigrescens*. The summary of scale rows, ventrals, and caudals fits well within those listed for *C. m. molossus* by Gloyd (1940) and by Klauber (1952, 1956).

The scale rows are consistently 27 or 29 at midbody in contrast to 23 or 25 in *m. nigrescens* south in Durango. Ventrals are 185–194, with males averaging 188 and females 193, much higher than in *m. nigrescens*, but average for *m. molossus*. A key based only on color pattern would place some of the specimens from the western mountains either as *m. nigrescens* or as intergrades of *molossus* x *nigrescens*, depending on the specimen at hand. A key based on scalation would place all Chihuahua specimens we have taken with *m. molossus*.

All indications are that the color and color pattern show intergradation between the subspecies *molossus* and *nigrescens* in the mountains of southwestern Chihuahua, but with scalation remaining as in *m. molossus*. A series from northern Durango may indicate where the scale variation approaches that of *nigrescens* and thus establish the area of intergradation. It now appears that intergradation is occurring over a much wider area than has been indicated by previous studies, perhaps in extreme southern Chihuahua and northern Durango. However, most specimens we have collected in southwestern Chihuahua (Chuhuichupa and south) do not show consistently the closed blotches above the ventrals as indicated by Klauber (1936, Fig. 64). Quite to the contrary, most have the dark edge of the blotches extending to the ventrals (his Fig. 63). Price (1980) indicates by map that a finger-shaped zone of intergradation extends north from Durango into the mountains of western Chihuahua. This area of intergradation would include Creel and north to near Chuhuichupa. We have collected six specimens from these areas, all of which are *m. molossus*. Only the specimen from Arroyo Guachochic in southwestern Chihuahua (near Río San Miguel) could be considered an intergrade, and this is based only on the increased pigmentation on the posterior third of the body. All scalation in this male also remains with the subspecies *molossus*: scale rows at midbody 27, ventrals 190, and labials 18-19 and 17-17.

Based on literature records (Gloyd 1940, Klauber 1936, 1952, Hardy and McDiarmid 1969) and the series available (at BYU), it is surmised that the area of intergradation is south of the Río San Miguel in Chihuahua, in northern Durango, and perhaps in the mountains of northeastern Sinaloa.

Crotalus pricei pricei Van Denburgh

Crotalus pricei Van Denburgh, 1895, Proc. California Acad. Sci., Ser. 2, 5:856.

Crotalus triseriatus Amaral, 1927, Bull. Antivenin Inst. Amer. 1:52.

Crotalus pricei pricei Smith, 1946, Univ. Kansas Sci. Bull. 31(1)(3):79.

3 mi N Chuhuichupa, 6 (BYU 15773–5, 15389, 13796 and 13888).

4 mi SW Chuhuichupa, 1 (BYU 15415).

16 mi SW Creel, 1 (BYU 14470).

12 mi W San Juanito, 1 (BYU 17082).

22.5 mi S of Creel on La Bufa Road, 1 (BYU 16951).

Gloyd (1940) lists specimens for the following localities: Casas Grandes, Colonia García, Guadalupe y Calvo, Galeana, 24 km (15 mi) N of Chuhuichupa, Guerrero, Miñaca, Pacheco, Río Piedras Verdes, Samachique, and San Blas Mountains.

This small, spotted species is seemingly common along the rocky crests of the riverbanks south and north of Chuhuichupa. Aside from those taken, several were seen disappearing in the porous rock formations.

The scalation is all within the limits of variation set forth by Gloyd (1940) and McCranie (1980). For the 10 specimens, the ventrals were 150(158.4)162 in males and 155(159.4)161 in females, caudals in males 24(26)30 and 19(22.2)24 in females. In 20 supralabial counts, 12 were 9, 6 were 10, and 2 were 8; the infralabials were 13 with 10, 5 and 9, and 2 with 11. The color and color patterns do not vary from the description given by Gloyd (1940).

Two specimens (BYU 15773–4), from 5 km (3 mi) N of Chuhuichupa, taken 27 August 1957, were gravid. The embryos were fully formed and numbered 5 in each clutch.

Crotalus lepidus klauberi Gloyd

Caudisona lepida Kennicott, 1861, Proc. Acad. Nat. Sci., Philadelphia 13:206.
Crotalus lepidus Cope, 1883, Proc. Acad. Nat. Sci., Philadelphia 35:13.
Crotalus lepidus klauberi Gloyd, 1936b, Occ. Papers, Mus. Zool. Univ. Michigan 337:2.
2 mi W Colonia Juárez, 1 (BYU 13416).
5.5–6.5 mi NE Colonia Juárez, 3 (BYU 14247, 15281–2).
Pacheco, 1 (BYU 33614).
2 mi E Cerocouhui, 1 (BYU 14244).
25.5 mi SE Creel (on road to La Bufo), 1 and 6 mature embryos (BYU 17114 and 37241–6).
Majorachic, 1 (EHT-HMS 23014).
On road to Sierra del Nido, 1 (UTEP 2570).
5 km S Yepómera, 1 (UTEP 2541).

This report includes 14 specimens seen from Chihuahua, 9 of which were taken in the mountains of western Chihuahua. Because there are considerable variations in color and color pattern between those taken in the mountains and those from the foothills on the eastern front, and because the systematics of *Crotalus semicornutus* is not fully resolved, the data on variation in this series may be of interest.

All specimens were taken west of Highway 45, with those from the foothills west of Nuevas Casas Grandes and near Colonia Juárez having the color and pattern of typical *C. l. klauberi* (Klauber 1956:56, Fig. 2:281). The montane specimens from Pacheco and south, to near the Barranca del Cobre, are darker in color with secondary spots and numerous flecks between the primary dark cross bars. Most are surprisingly similar in the body pattern to that figured by Klauber (1956:67, Fig. 2:27) for *C. l. lepidus*, except that the parietal-nape spot is single and large, and the crossbars are large and dark as in *l. klauberi*. An adult female taken 40.8 km (25.5 mi) SE of Creel has the nape spot single, but with divided posterior extensions and the anterior cross bars showing some dorsal enlargement. A clutch of six nearly mature young and one infertile egg were removed from her; all color patterns are mature and resemble the adult.

A specimen from 3 km (2 mi) E of Cerocouhui (approximately 120 km or 75 mi SW of Creel) is, except for the darker color, a typical *l. klauberi*. We failed to secure specimens from the Majorachic-Maguarichic area. Those taken from south of the type locality of *Crotalus semicornutus* Taylor (1944) do not show the pattern of *semicornutus*, retaining the basic pattern of *klauberi*, with the strong secondary spots and flecking of *l. lepidus*.

A comparison of the scalation shows great similarity. Ventrals 158-170; males 159-163.3-170 and females 158-161-169. Caudals 19-28; males 19-25-28 and females 19-21.6-25. Scale rows are consistently 23 at midbody, and the head scales are consistent except that the loreals may vary from 1 to 5. When these variations are compared to the averages of the larger series reported by Gloyd (1940) and Klauber (1956), no difference is apparent. The number of transverse body blotches is also approximately the same, at 17.5.

When our data and those presented by Gloyd (1940) and Klauber (1956) are compared to the characters reported for *Crotalus semicornutus* Taylor, it is seemingly apparent that *C. semicornutus* is a pattern variant of *C. l. klauberi* Gloyd. The large vertebral spots in the type of *semicornutus* and the increase in pigmentation and secondary spotting between the body blotches of other montane specimens does suggest that the population in the mountains of western Chihuahua does have color pattern deviations from that of typical *C. l. klauberi*, as was observed in specimens from near Colonia Juárez.

Except that the specimen taken south of Creel has a single nape spot, it could pass as a *C. l. lepidus*. The strong *lepidus* influence in the mountain populations from southwestern Chihuahua to Jalisco is now apparent and was suggested by Klauber (1952). Furthermore, *C. l. maculosus* (Tanner, Dixon, and Harris 1972), with its dark pigmentation and divided nape spot, is apparently more easily derived from *lepidus* than from *klauberi*.

As indicated above, there appears to be a strong color and pattern influence of *l. lepidus* remaining in the mountain populations of western Chihuahua. The presence of secondary spotting, the dark pigmentation both dorsal and ventral, and apparently the geographic isolation (separated from *l. lepidus* by typical *l. klauberi* along the eastern foothills of the Sierra Madre) may have led Taylor to describe *C. semicornutus*.

One may speculate that *C. l. klauberi* is a recent, vigorous form now extending its range southward and replacing *C. l. lepidus*, or that perhaps the influence of *lepidus* has been ex-

tended northward from the area of intergradation, now occurring apparently in the southern areas of their distribution. It may also be possible that *lepidus* is less easily displaced in the mountains than along the foothills, and thus the residual color pattern. The evidence of a retention of *lepidus* characters, particularly color and color pattern, is best exhibited in *C. l. maculosus*. The narrow crossbars, often broken on the sides in *lepidus*, the divided nape spot, and the dark pigmentation can be related to *lepidus* but not to *klauberi*. The present data give strong evidence that *lepidus* was present in the western mountains of Chihuahua before *klauberi* arrived and seemingly is slowly being replaced by a more vigorous form. Or is it possible that the color patterns and coloration is influenced by the environment and that the scalation in the subspecies *lepidus* and/or *klauberi* is more meaningful in determining taxa? Vincent (1982) examined a large series of two populations from western Texas and observed that significant differences in ground color and color patterns occurred. He concluded that these color and pattern differences resulted from the dominant substrate colors that differ between ranges. His conclusion appears true of the series from Chihuahua, with no real difference in scalation and with color and color pattern showing localized variation that places, for the present, all *C. lepidus* specimens from Chihuahua in the subspecies *klauberi*. Thus, *Crotalus semicornutus* Taylor is apparently only a color morph within the subspecies *C. l. klauberi*.

All our specimens have been taken on rocky hillsides and usually from under rocks. On one occasion a specimen (BYU 15281) was disturbed while out foraging; at least it was disturbed while not under cover, and immediately it began rattling and moved rapidly down the hill, parting the grass as it moved (12 September 1959). I have observed many rattlesnakes in the open, but never before one with such speed and agility.

Crotalus scutulatus scutulatus Kennicott

Caudisona scutulata Kennicott, 1861, Proc. Acad. Nat. Sci., Philadelphia, p. 207.

Crotalus scutulatus Klauber, 1930, Trans. San Diego Soc. Nat. Hist. 6:1–17.

Crotalus scutulatus scutulatus Price, 1982, Cat. Amer. Amph. and Rept., p. 291.
1 mi W Sueco, 1 (BYU 19133).
9 mi E Ricardo Flores Magón, 1 (BYU 17109).
4 mi E Ricardo Flores Magón, 1 (BYU 15351).
4 mi E Buenaventura, 1 (BYU 15314).
24.5 mi W Sueco, 1 (BYU 15313).
23 mi E Buenaventura, 1 (BYU 15261).
11.5 mi N Colonia Dublán, 2 (BYU 13872 and 15479).
6.8 mi SE Nueva Casas Grandes, 1 (BYU 15350).
11 mi SE Nueva Casas Grandes, 3 (BYU 13871, 15349 and 15371).
25 mi N Ciudad Chihuahua, 1 (BYU 21717).
28 mi S Sueco, 1 (BYU 15344).
38 mi N Ciudad Chihuahua, 1 (BYU 15296).
5-6 mi N Ciudad Chihuahua, 7 (BYU 15295, 15297, 15320–1, 15345, 16987 and 17113).
17 mi N Ciudad Chihuahua, 1 (BYU 17108).
10 mi W San Francisco del Oro, 1 (BYU 15678).
13.5 mi N Jiménez, 1 (BYU 14074).

Records provided by Dr. Robert Webb (UTEP) list six specimens taken along Highway 45 from south of Villa Ahumada to 32 km (20 mi) W of Jiménez. Gloyd (1940) and Klauber (1956) show distribution by map shading rather than by locality.

Distribution based on the above localities establishes *C. s. scutulatus* in the low, rolling hills and desert valleys extending east from the mountains. Price (1982) lists localities that are apparently in the montane areas of western Chihuahua. I did not find them in the western mountains.

We found *C. scutulatus* on the rocky hillsides and *C. atrox* in the brushy valleys; thus, these two species occur widely in the low desert ranges and valleys, but there is seemingly a difference in the habitat niche that each occupies. The only other species we have taken in this general habitat area is *C. m. molossus*. The single specimen taken in a rocky arroyo, 17 km (11 mi) W of R. F. Magón, does not suggest that *molossus* represents an important competitor for the more common species *C. atrox* and *C. scutulatus*. Color pattern and scalation do not vary from those listed by Gloyd and Klauber.

Crotalus atrox Baird and Girard

Crotalus atrox Baird and Girard, 1853, Cat. N. Amer. Rept., p. 5.
20 mi S Palomas, 1 (BYU 13869).
Sueco, 1 (BYU 15338).
15 mi W Sueco, 1 (BYU 17107).
17.7 mi E Ricardo Flores Magón, 1 (BYU 15356).
12 mi E Buenaventura, 1 (BYU 15299).

9 mi SE Galeana (N of Buenaventura), 2 (BYU 13870 and 15342).
14 mi N Colonia Dublán, 1 (BYU 13866).
5 mi SE Nueva Casas Grandes, 2 (BYU 13867–8).
11 mi SE Nueva Casas Grandes, 2 (BYU 15261 and 15278).
7 mi SE Nueva Casas Grandes, 1 (BYU 15322).
6 mi N Chihuahua City, 3 (BYU 15294, 15298, and 15319).

Neither Gloyd (1940) nor Klauber (1952) list locality records. Records provided by Dr. Robert Webb show five localities from 20 mi S of Ciudad Juárez along Highway 45 to 10 km (6 mi) N of El Sueco. All other records available indicate that *C. atrox* occurs in the desert valleys and foothills of northern and eastern Chihuahua. All locality records listed above are below 1800 m (6000 ft), and range from approximately 1300 to 1700 m (4500 to 5500 ft).

We found them to be common along the roads and in the valleys between El Sueco and Colonia Juárez. A few badly mashed ones were seen along the road to Chihuahua City. In spite of our many trips into the mountains of western Chihuahua, none have been found above 1800 m (6000 ft). If our records are indicative of the range of this species in Chihuahua, then the species does not occur over much of western Chihuahua, as was indicated by the range map of Klauber (1956, Fig. 2:1). The wide range of this species does extend across the lower plainlands from Arkansas to California, but it does not apparently include the high elevations of the various mountain ranges in western Chihuahua, preferring to live (to quote Klauber 1952) "in dry—even arid—country, such as brush-covered plains, dry washes, sandstone outcrops, or mesquite crowned dunes." This is a good description of the terrain south of Ciudad Juárez on both sides of Highway 45 to southern Chihuahua, and westward in the low valleys to the mountain foothills.

We soon discovered that *C. atrox* was temperamental and, at times, aggressive. On 20 August 1957, while riding horses in a brushy pasture about 8 km (5 mi) SE of Nueva Casas Grandes, a medium-sized (805 mm) *C. atrox* sprang full length, barely missing the hind legs of the horse just in front of me. That same evening, while road running, a smaller one sprang at me as I approached it. Other species either took a defensive position or moved away to cover. We soon noted whether we were dealing with *atrox* or *scutulatus*, the latter in our experience being much less aggressive. The color pattern and scalation conform closely to those published previously by Gloyd (1940) and Klauber (1930 and 1952).

Crotalus viridis viridis (Rafinesque)

Crotalus viridis Rafinesque, 1818, Amer. Month. Mag. Crit. Rev., 4:41.
Crotalus viridis viridis Klauber, 1936, Trans. San Diego, Soc. Nat. Hist. 8:194.
El Espía, reported by Smith and Taylor, 1945, 1 (USNM 264. See Klauber 1952, 26:103).
16 mi E of Chihuahua-Sonora border on the Bavispe to Nueva Casas Grandes Road, 1 (CAS-SU 14361).

Our collecting south of Ciudad Juárez, Las Palomas, and Antelope Wells (across the border south of Lordsburg) has not provided a specimen of *viridis*. The California Academy specimen does establish an authentic record verifying the earlier USNM specimen taken in the 1850s. The full extent of the range of *viridis* in Chihuahua must yet be established. For the present, it is expected to be found only in the northwestern corner of Chihuahua, perhaps from the vicinity of Las Palomas westward in the foothills and into extreme northeastern Sonora.

Crotalus willardi amabilis Anderson

Crotalus willardi amabilis Anderson, 1962, Copeia 1:160–163.

The type and 10 paratypes, all from the Sierra del Nido, are deposited in the Museum of Vertebrate Zoology (68895–68900, 71015–71016 and 66177, 68894 and 68893). This series was seen, but not examined. The Sierra del Nido are east of the Sierra Madre Occidental and extend from an area slightly southwest of Gallego to just northwest of Ciudad Chihuahua. The principal drainage is from the western slopes into the basin of the Río Santa Clara, which flows north to terminate in the desert basin near Villa Ahumada. This range has an elevation above 2400 m (8000 ft), and thus provides for isolation from the western highlands.

The fieldwork of Dr. James D. Anderson provides material that is not only indicative of isolation but also of some species not yet known to occur in the western mountains.

Crotalus willardi silus Klauber

Crotalus willardi Meek, 1905, Fld. Col. Mus. Pub. 104, Zool. Ser. 7(1):18.

Crotalus willardi silus Klauber, 1949, Trans. San Diego Soc. Nat. Hist. 11(8):128.

Type locality on Río Gavilán, 7 mi SW of Pacheco (MVZ 46694).

Red Rock, Tinaja Canyon, 12 mi W highway between Casas Grandes and Colonia Juárez, 4 (BYU 13843–6).

Upper fork of Nutria Creek (tributary of the Río Bavispe near Chihuahua-Sonora border), 1 (BYU 13487).

On rim trail approximately halfway between Urique and Cerocouhui, 1 (BYU 14596).

Chuhuichupa, 1 (BYU 15480).

1 mi W Chuhuichupa, 3 (BYU 15720, 15722–3).

5 mi W Colonia García, 1 (BYU 15388).

Gloyd (1940) lists specimens for the following localities: Colonia García, Dist. Guerrero, Río Piedras Verdes (head of canyon), Sierra Madre, Tamarino, and Majorachic. Klauber (1949) lists the following new localities: Río Gavilán 11 km (or 7 mi SW of Pacheco) and halfway between Majuarachic and Las Varas.

The most southern locality previously reported was Majorachic. The specimen (BYU 14596) taken near the canyon rim west of Urique is the most southern *C. w. silus* available to me. Its color pattern, and particularly that of the head, does not vary from those seen from northern localities.

Two specimens (BYU 15480 and 15722) each had recently eaten a small rodent, and two (BYU 15388 and 15720) had large oviducal eggs, 7 and 6, respectively.

Scale and color patterns do not vary appreciably from published reports by Gloyd (1940) and Klauber (1972). The only significant variation occurs in the caudals, which average higher than those listed by Klauber (1972, Table 2:7): caudals, males (5), 31-32-35; females (6), 27-29.7-34.

Harris and Simmons (1976) list the subspecies *C. w. obscurus* as occurring in the Sierra de San Luis of Northwestern Chihuahua. This is based on a single specimen (UA 27943) from the west slope of that range. We did not collect in these mountains and assume the specimen to represent an addition to the fauna of Chihuahua. In their report is a lengthy and useful discussion of the habitats within the range of the species *C. willardi* and their understanding of the isolation factors that have resulted in the subspeciation within the species. A table of meristic characters for the *willardi* subspecies is provided, as well as a suggested phylogeny.

ACKNOWLEDGMENTS

I am indebted to a number of individuals and families who assisted during the fieldwork conducted in various parts of Chihuahua. We were accepted not only by the American colonists, but also by the Mexican and Indian individuals with whom we came in close contact upon numerous occasions.

At Colonia Juárez we were fortunate in having an opportunity to stay at the homes of Mr. and Mrs. David Johnson and Mr. and Mrs. Irvin Romney. Mr. George Turley was also very helpful, but perhaps those most understanding of our aims in the gathering of material were the Hatch brothers, Herman, Roy, and Seville. We were particularly grateful to the Herman Hatch family, who not only permitted us to bed down under the old apple tree at any hour of the day or night, but offered us their hospitality and served as information agents for our travels in much of northern and central Chihuahua.

Our first trip into the mountains was with the Colonia Juárez Scout troop to the Río Bavispe (just below Three Rivers), and the next year with Amilio Borgous to Chuhuichupa. These trips introduced us to the mountains and prepared us, so we thought for the barrancas of southwestern Chihuahua.

In Colonia Dublán Mr. Alma Jarvis, who was the postmaster, provided us with valuable information concerning areas for which he was well informed, and Mr. and Mrs. Keith Bowman upon a number of occasions provided us with meals and a place to stay.

In Ciudad Chihuahua, we were fortunate in becoming acquainted with Mr. Harold Pratt who was the Chihuahua agent for the Allis-Chalmers Equipment Company. Mr. and Mrs. Pratt opened their door to us, provided an opportunity for us to recoup after having been in the mountains for a time, and also gave us an opportunity to reassemble our collections in preparation for the trip home. Also, it was from their estate that we were able to spend collecting time in the Ciudad Chihuahua area. We were also fortunate to have met a friend, Mr. Ray Thane, in San Francisco

del Oro, who provided us with information and an opportunity to visit with a Mexican family.

During the years spent in Mexico, I had the good fortune of having as companions a number of capable faculty and graduate students. The first trip (1956) involved Mr. Verle Allman, a biology teacher, and my son Lynn. For the next four years I had as my companion Dr. Gerald W. Robison. We were accompanied upon one occasion (1958) by Dr. and Mrs. Irving W. Knobloch, he a professor of botany from Michigan State University, and upon another occasion with Dr. Stephen L. Wood, an entomologist from BYU, and his graduate student Dr. Jay B. Karran.

The trip to Urique with Dr. Knobloch was a highlight, as was the trip with Dr. Wood to Maguarichic. Each trip added to our species list and seemed to compel us to plan the next trip. In October 1963 I was a member of the John Cross expedition into the Barranca del Cobre. Although we could not run the river as planned, we did get considerable publicity in both Chihuahua and U.S. newspapers and had the opportunity to secure additional material and data. Mr. John Cross is an accomplished adventurer and river runner, having been interested in commercial river expeditions during much of his life. His interest in the rivers of southwestern Chihuahua was thus not only a part of his vocation but also an adventure for him into a new river system. Mr. Cross made at least two additional trips into the barrancas of southwest Chihuahua: one down the Rio Urique, from just above the Divisadero to Urique (Figs. 8 and 9A–F), and one from the Rio Verde, south of Guachochic into the Rio San Miguel and to the junction of the Rio Urique. Although herpetology was not their prime interest, a number of new records for Chihuahua were obtained and deposited in the BYU collection. During the next few years I had as my companions either Dr. Glen T. Moore, a botany professor at BYU, or Dr. Kenneth R. Larson, a graduate student at that time.

Upon occasion we solicited the aid of some of the Mexican people, particularly when we were short-handed in the mountain areas. We found them to be very cooperative, and at no time were we ever made to feel unwelcome. For example, when we were at Creel the La Bufa mining superintendent helped us to secure the necessary fuel to complete our trip into the southeastern barranca area. At Cerocouhui we parked our truck and all of our contents by the side of the Catholic church, where it remained for over a week totally unmolested. We found that the Mexican people in the mountains were not only friendly, but very trustworthy.

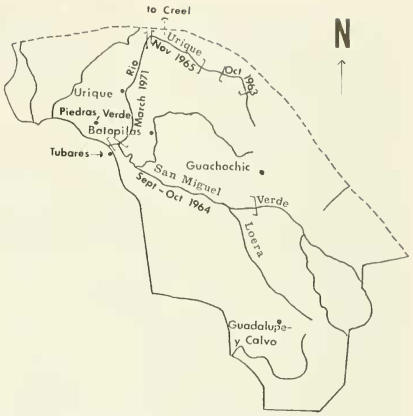

Fig. 8. Map of the area traversed by J. L. Cross during his river-running expeditions in southwest Chihuahua.

Specimen Materials

Except for a few exchanges made with other museums and university collections, the materials gathered during the 15 years of collecting are deposited in the herpetological collection at Brigham Young University. We have sent a few specimens to the University of Mexico, and have, in all of our collecting trips, tried to observe the collecting regulations set forth by the Mexican government. During our collecting it was not our intent to take large samples of any one species at any one locality, but we were interested primarily in determining, as far as possible, the species and subspecies that actually occur within the state of Chihuahua.

For the loan of comparative specimens, I am indebted to the following individuals and institutions: Dr. Charles C. Carpenter, University of Oklahoma (UO); Dr. William G. Degenhardt, Dr. Roger Conant, and Mr. Lee

Fig. 9. A series of photographs from southwestern Chihuahua showing the rugged terrain in and around the Barranca del Cobre and the Rio Urique.

A. Looking northwest across the Barranca del Cobre toward the Divisadero. Tarahumara dwelling is in the foreground.

Fitzgerald, Museum of Southwestern Biology, University of New Mexico (NMMZ); Dr. William E. Duellman and Joseph T. Collins, Museum of Natural History, University of Kansas (KU); Dr. M. J. Fouquette, Jr., Arizona State University (ASU); Dr. Arnold G. Kluge, University of Michigan, Museum of Zoology (UMMZ); Dr. Alan Leviton and Dr. Robert C. Drewes, California Academy of Sciences (CAS and CAS-SU); Dr. Charles H. Lowe, University of Arizona (UAZ); Dr. Roy W. McDiarmid, U.S. National Museum (USNM); Dr. Douglas A. Rossman, Museum of Zoology, Louisiana State University (LSUMZ); Dr. David B. Wake, Museum of Vertebrate Zoology, University of California (MVZ); Dr. Robert G. Webb, University of Texas at El Paso (UTEP); and Monte L. Bean Life Science Museum, Brigham Young University (BYU).

I greatly appreciate information provided by Dr. Richard D. Worthington, Dr. Roger Conant, Dr. Robert Webb, and also, for his cooperation and the loan of Arizona and Chihuahua specimens, Dr. C. H. Lowe.

I am indebted to Mr. John L. Cross for his kindness in permitting me to accompany him on one of his trips in southwestern Chihuahua (October 1963) and for the use of his field journals from his other trips into the Rio Urique Barranca and the valley of the Rio San Miguel. From his interest in our project, a number of genera (*Leptodeira*, *Leptophis*, *Oxybelis*, and *Rhadinaea*) were added to the fauna. Other specimens extended ranges and helped in a better understanding of systematic relationships. I was also the recipient of his entire herpetological collection, without which this study would have been greatly wanting for material from southwestern Chihuahua.

The drawings are by Mrs. Diane Mellor, library and reference work was done by Mrs. Jody Chandler, and the manuscript was typed by Mrs. Colleen Taylor. To each I am indeed grateful for their help.

B. Looking north from south rim of Barranca del Cobre.

The manuscript was reviewed by Dr. Hobart M. Smith and Dr. Carl S. Lieb.

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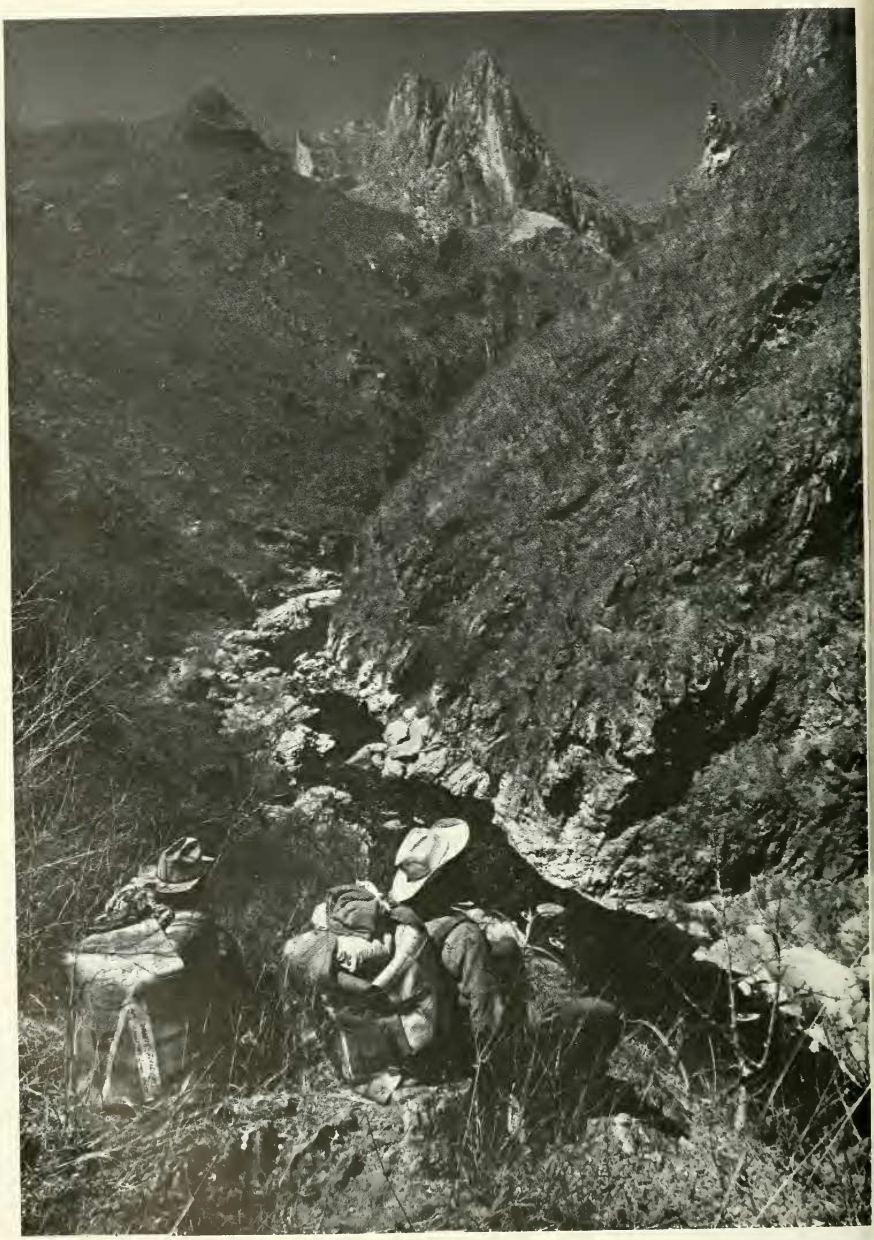
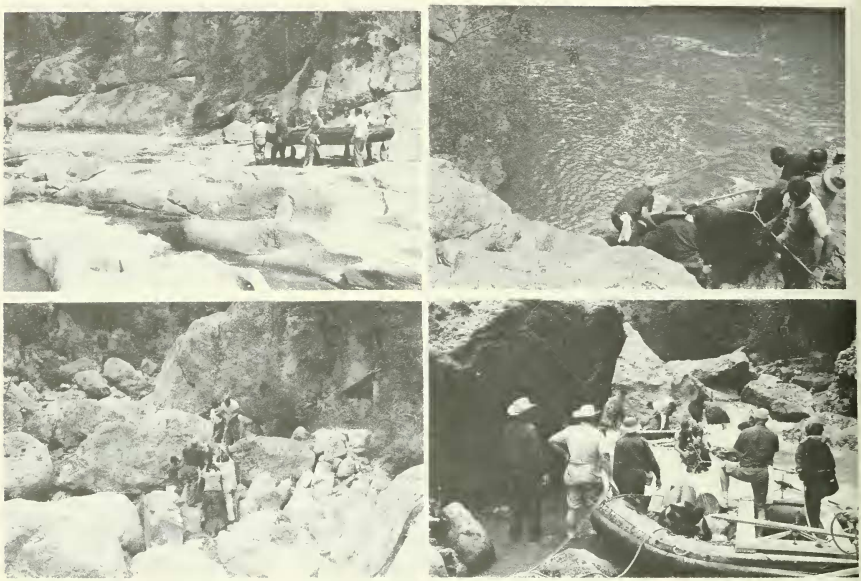


C. Just below the Divisadero looking north up the Rio Urique. Part way up the slope and looking down at the boats in the river below.

D. Rio Urique just below Divisadero, looking downstream.



E. Photographs showing our attempt to run the Rio Urique. Top photos showing portage around two waterfalls. Bottom photos showing the boulder-filled channel.

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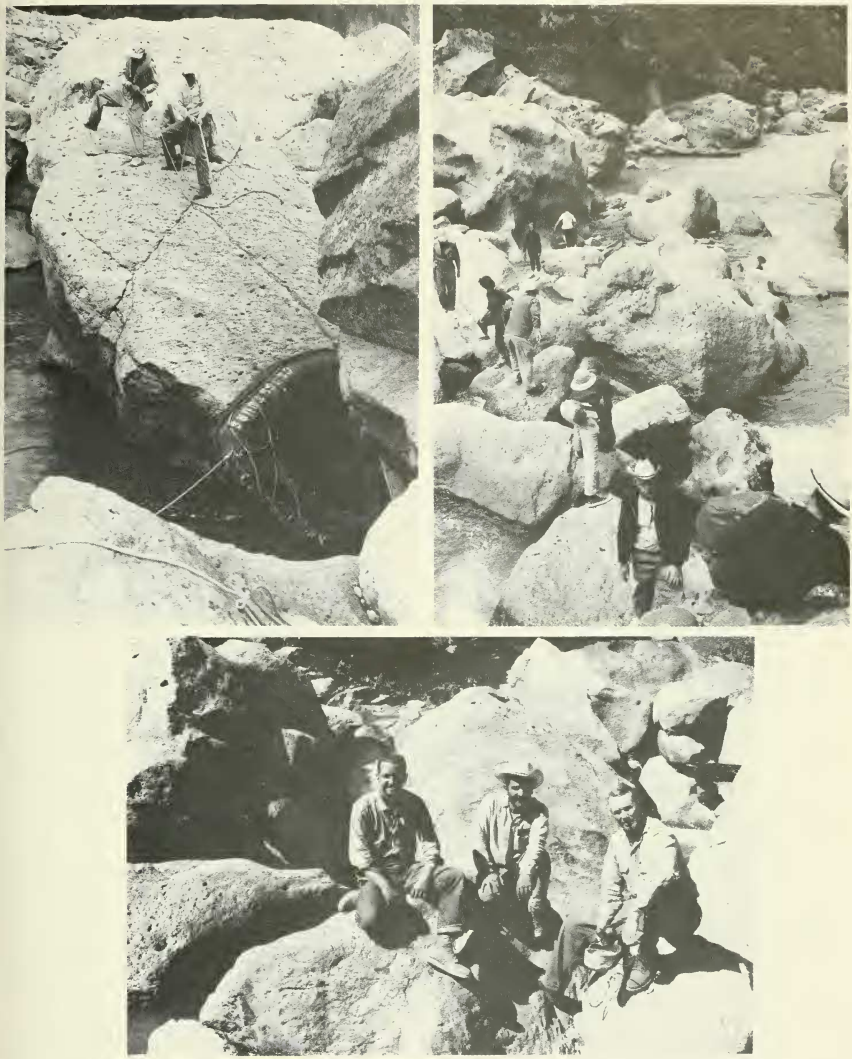

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